

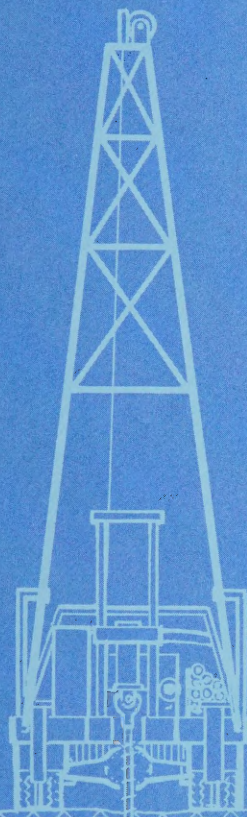
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Groundwater Evaluation: Ground Water Supply For Department of Environment' 1

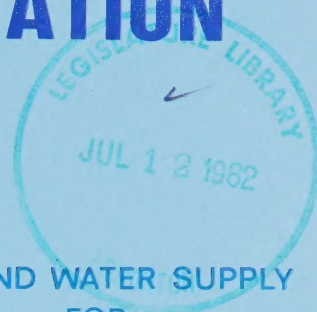


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GROUNDWATER EVALUATION



GROUND WATER SUPPLY
FOR
DEPARTMENT OF ENVIRONMENT'S
LABORATORY
AT VEGREVILLE

LIBRARY
VAULT 19

prepared for:

Alberta
ENVIRONMENT

EARTH SCIENCES AND LICENSING DIVISION
GROUNDWATER DEVELOPMENT BRANCH



EBA Engineering Consultants Ltd.

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April 1, 1975

Our File: E 1028

Mr. H. A. Kerr, M.Sc., P.Eng., P.Ag., P.Geol.
Head, Ground Water Development Branch
Earth Sciences and Licensing Division
Department of Environment
Milner Building
EDMONTON, Alberta

Re: Ground Water Supply for the Department of Environment's Laboratory
at Vegreville

Dear Sir:

We are pleased to report that a flowing well has been successfully completed and tested at the proposed laboratory site at Vegreville. The quantity of water obtained will be more than adequate for construction and consumption, however, if it is proposed to use this source of water for the laboratory it will require treatment to remove the high levels of iron present in the water.

This report outlines the test drilling program and pump test carried out on the well. Well records from the area were reviewed and are presented in Appendix B.

It has been a pleasure to carry out this assignment and we are confident that the well will meet the water requirements for the laboratory.

Yours truly,

EBA ENGINEERING CONSULTANTS LTD.

Philip L. Hall

P. L. Hall, M.Sc., P.Geol.
Senior Hydrogeologist

PLH/sjm



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ABSTRACT

A total of six test wells were drilled on Sections 23 and 24 of TWP 52, RGE 15, West of the fourth meridian.

Three holes were drilled to a depth of 500 feet to determine if there were any significant bedrock aquifers in the area. None were encountered and so a production well and two observation wells were constructed in a preglacial channel above the bedrock.

The well was pump tested at 75 l/gpm and average aquifer coefficients are:

Transmissivity - 11,000 l/gpd/ft
Storage Coefficient - 3.5×10^{-4}

The well is flowing at approximately 10 l/gpm and a constant head test was carried out on the production well. Discharge rates during this test fluctuated and only approximate aquifer coefficients could be calculated. These values were:

Transmissivity - 8,875 l/gpd/ft
Storage Coefficient - 5.47×10^{-5}

The water quality is generally acceptable with the exception of the high iron content of 4.7 ppm which is considerably higher than the recommended limit of 0.3 ppm. If the water is to be used for consumption it will require treatment.

The water will be adequate for construction purposes and either a centrifugal or submersible pump could be used to pump water from the well.

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APRIL 1, 1975



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1.0 INTRODUCTION

EBA Engineering Consultants Ltd. were authorized to carry out a ground water evaluation for the proposed Department of Environment's Research Laboratory near Vegreville, by H. A. Kerr, on February 5, 1975. This evaluation consisted of initial exploratory test holes, followed by the completion of a production well. The major water requirements of the laboratory will be supplied by the town of Vegreville. The purpose of the production well is to supply construction needs, and as a secondary water source in case of emergency. Hence, the decision on the location of the production well was influenced by hydrogeological data and its proximity to the proposed building site.

2.0 LOCATION AND TOPOGRAPHY

The proposed Research Laboratory will be located approximately $1\frac{1}{2}$ miles North West of the town of Vegreville; LSD8, SEC 23, TWP 52 RGE 15 West of the fourth Meridian. The land, owned by the Department of the Environment, includes the entire section 23, and the southwest quarter of section 24.

The topography of the Vegreville area is gently rolling, with extensive flat-lying areas. The Vermilion River is the major river in the area. The region is sparsely treed and is well suited for farm land.

The area is covered by the National Topographic 1:50,000 Map Series Number 83H/9, East Mundare. Air photographs are available at a scale of $1" = 2,640$ feet, and were flown in 1967. The photographs covering the area are AS979, numbers 147 and 148.

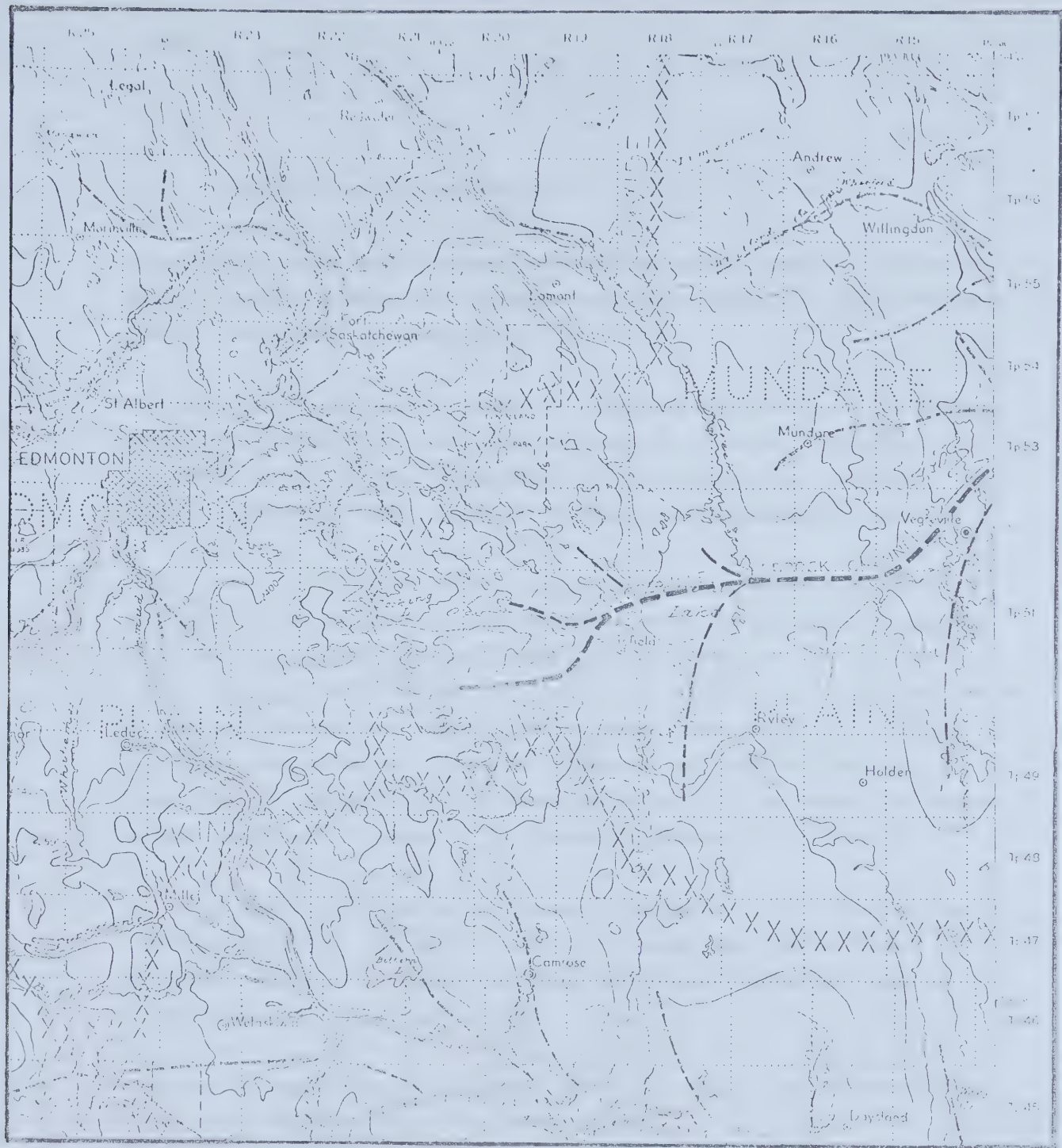
The elevation of the site is estimated from the 1:50,000 scale map to be 2,100 feet above sea-level.

3.0 CLIMATE

The climate of the area is humid continental. The temperature can range from 90°F in the summer to -35°F in the winter. The average precipitation in the area is approximately 16 inches per year. The average relative humidity is approximately 66.5 percent.

4.0 GEOLOGY

The bedrock in the Vegreville area is the Belly River Formation, which consists of thin alternating sandstones, siltstones, shales, sandy shales and coal seams. The bedrock surface coincides very closely with the present land surface and is mainly flat. The bedrock surface in the area has been termed; the Mundare Plain. The Mundare Plain is drained by the Vegreville Bedrock Channel, which is the major bedrock low in the area. The location of the channel and its tributaries is shown in Figure 1. The channel was formed by a preglacial river which had its origin just east of Cooking Lake. The channel continues east and then swings north just west of Vegreville. "The channel is narrow and has steep banks throughout its extent." (Farvolden, 1973, Page 60). The entire area of Vegreville is overlain by unconsolidated glacial deposits, chiefly till (clay), and some sand and gravel. The thickness of this till varies, but in the proximity of the town, it is approximately 100 feet thick.



EXPLANATION

- Bedrock channel, center line...
- Bedrock physiographic boundary...
- Contour, bedrock surface...

SCALE IN MILES
6 4 2 0 2 4 6 12

CONTOUR INTERVALS 100 FEET
Elevations in Feet above Mean Sea Level

REFERENCE

- City; Town; Village...
- Stream, intermittent...
- Township boundary...
- Contour, surface elevation...

FIGURE 1
(FARVOLDEN, 1963, APPENDIX)

5.0 EVALUATION OF EXISTING DATA

Water well records were reviewed at the Alberta Department of the Environment, Licensing Branch, and the Alberta Research Council. This information is summarized in Appendix A.

The average well depth in the area is approximately 90 feet. The average depth to bedrock in the test holes drilled was 95 feet. The majority of the wells in the region are completed in the glacial tills, with a smaller percentage being completed in the Belly River Formation.

There were no transmissivity or storage coefficient values available for the wells in the area. The area had low yields, as indicated by pumping rates of 2 to 5 gpm. The low yields in both the bedrock and glacial tills are most likely due to very thin, fine grained, sands and sandstones, of limited areal extent. "Supplies of ground water from wells in this region may be sufficient to satisfy domestic and limited livestock requirements. However, many of these wells may also be pumped dry under normal conditions of usage." (E. Gordon Le Breton, 1963, Page 19).

The water quality in the lab site area is generally within the acceptable limits, except for iron content, which is higher than the 0.3 ppm, acceptable level. The high iron concentrations are prevalent both in the bedrock and glacial tills.

The town of Vegreville is presently taking its water from the Vermillion River, most probably due to the above reasons.

The only source in the area for the yields required by the laboratory, was the buried bedrock channel. Close examination of the airphotos revealed a slight low trending northeast through the centre of Section 23. This low was later found to be a reflection of the buried bedrock channel. Figure 2 illustrates the local flow in the site area.

6.0 DRILLING PROGRAM

A total of six holes were drilled in the property, which included two observation wells, and the main pumping well. Figure 3 illustrates the location of the test holes in relation to the outline of the bedrock channel, as interpreted from airphotos. Figure 4 shows a detailed plan view of well and observation well locations.

Test holes 1, 2 and 4 were drilled to 500 feet to determine the existence of bedrock aquifers. The information acquired indicates that there are no significant bedrock aquifers in the test area.

Test holes 1 and 4 are on the southern edge of the channel, with test holes 2, 3, 5 and 6 being within the channel.

After the completion of test holes 1 to 4, the well (TH6) location was chosen. Test hole 3 was used as one observation well and TH5 was drilled as a second observation well. Figure 5 illustrates completion details of observation and pumping wells.



TWP 52, RGE 15, W 4th
SCALE 1" = 1/2 MILE



FIGURE 2 STATIC WATER LEVELS (LOCAL FLOW) FROM WATER WELL RECORDS

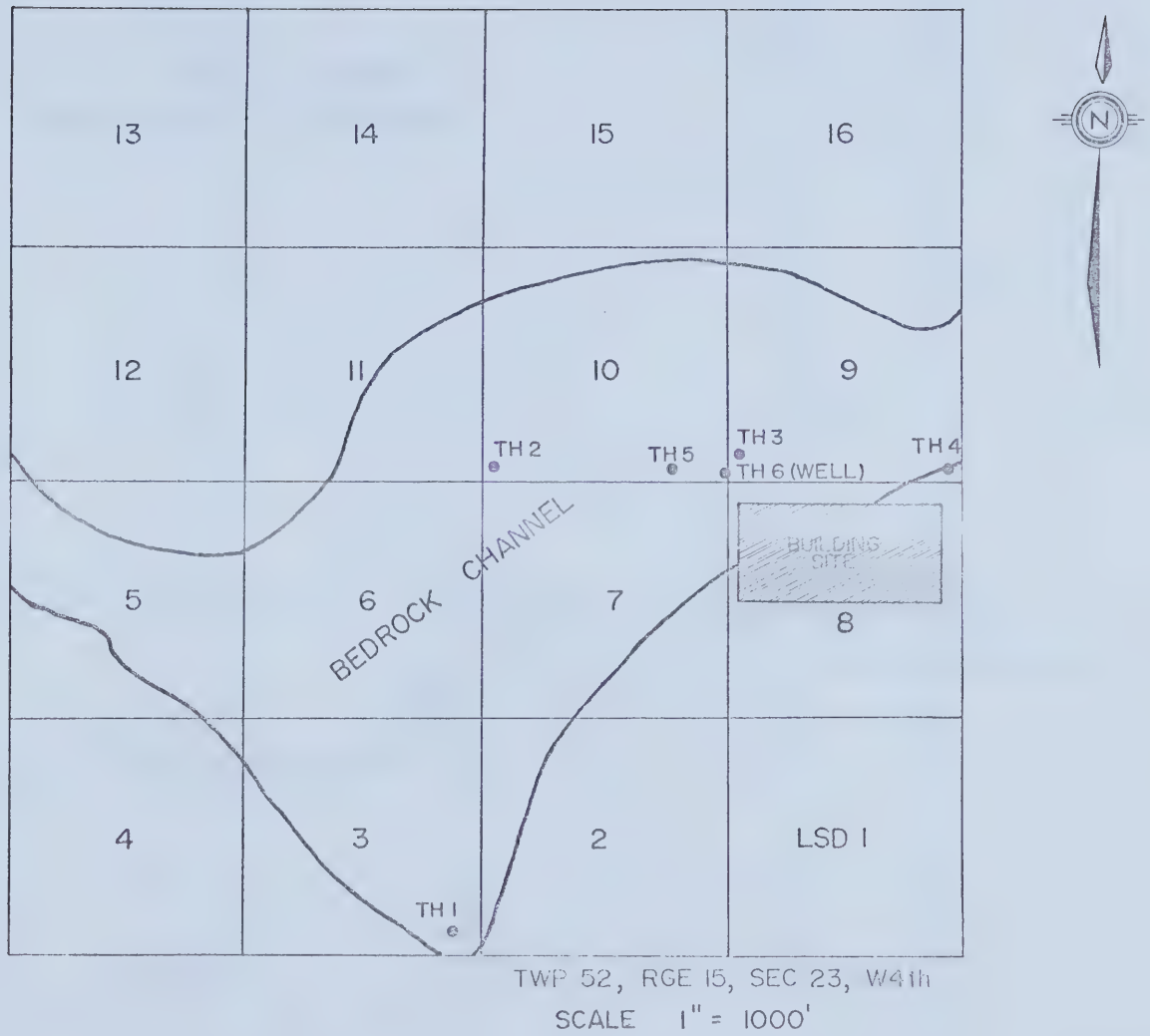
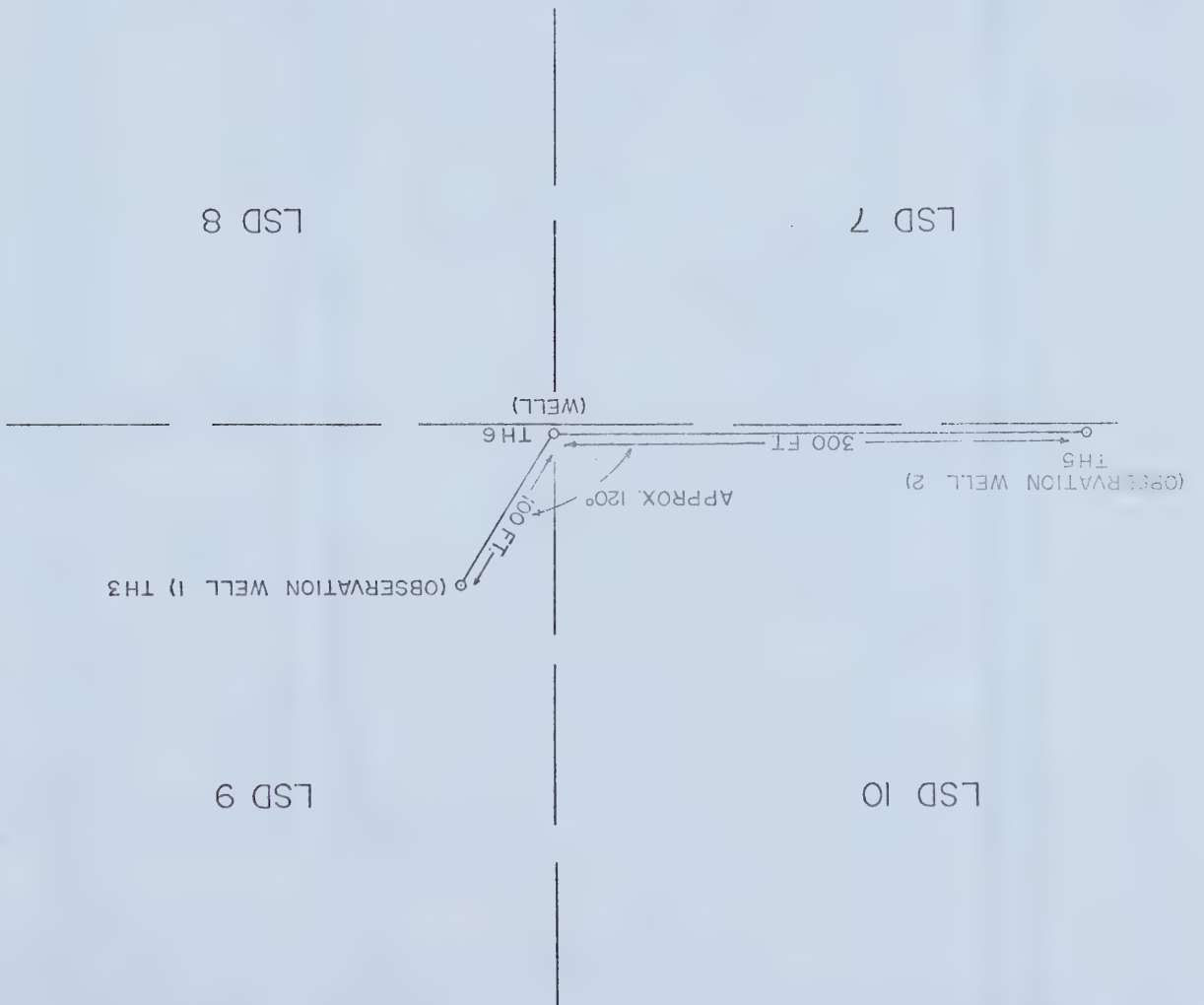


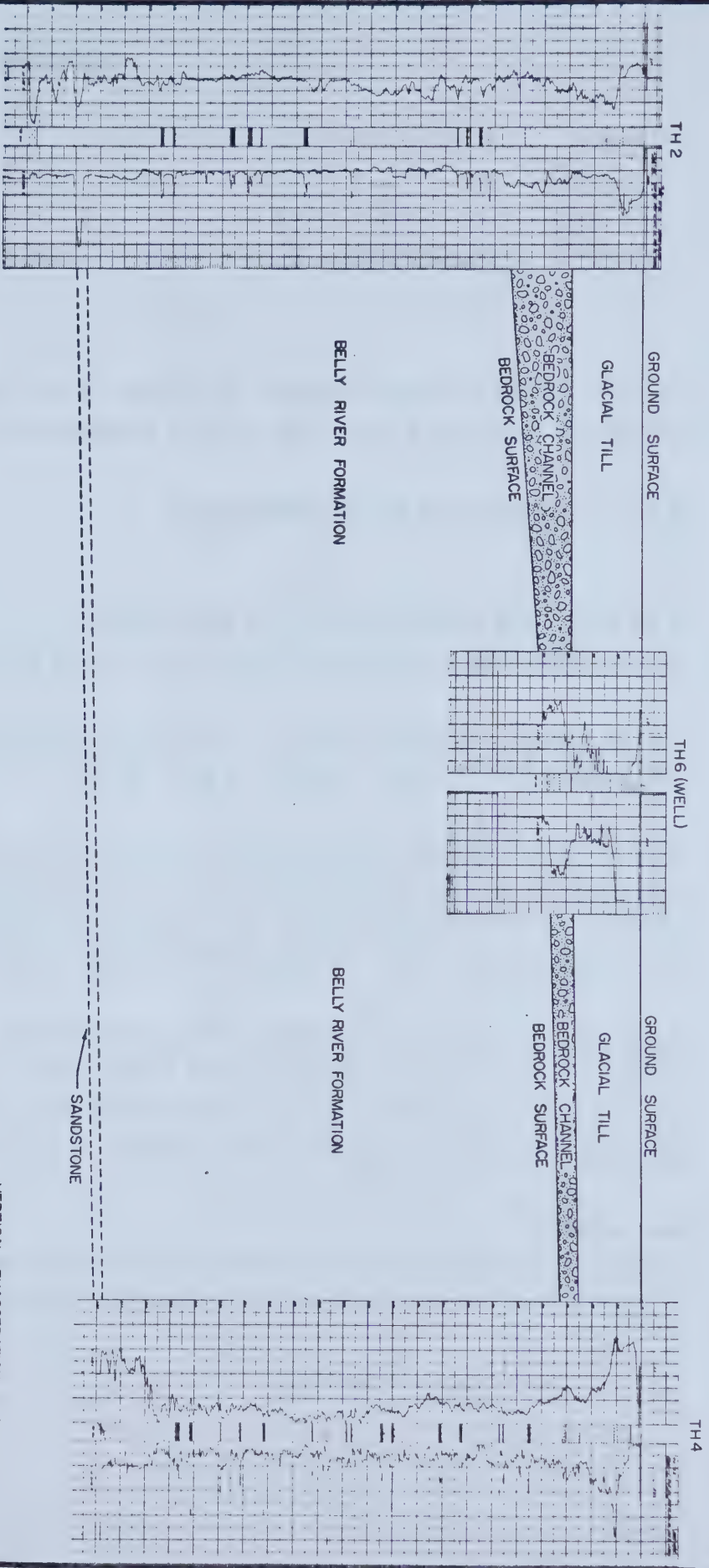
FIGURE 3 LOCATION OF TEST HOLES IN RELATION TO THE BEDROCK CHANNEL

FIGURE 4 DETAILS OF OBSERVATION AND PUMPING
WELL LOCATIONS

TWP 52, RGE 15, SEC 23, W4th
SCALE 1" = 100'







DWN BY: RER
 DATE DWN: APRIL 1/75
 SCALE: AS SHOWN
 JOB NO.: E 1028



Engineering Consultants Ltd.

LOOKING NORTH THROUGH
 BEDROCK CHANNEL

DWG: 28-7
 SHT NO.

7.0 PUMP TEST AND ANALYSIS

A 24 hour pump test was conducted at a pumping rate of 75 gallons per minute. The pump was set at 38 feet, and a total drawdown of 15.90 feet was observed.

Both TH6 (well) and TH3 flowed upon completion. The static water level for the pumping well was 4.40 feet above ground level and the static water level for TH3 was 5.33 feet above ground level. TH5 had a static water level of 0.0 feet. The pump test field notes are in Appendix B.

The transmissivity values ranged between 5, 156 IGPD/Ft. and 21,064 IGPD/Ft. Both of these high and low values were calculated from TH5 (observation well No. 2) and are probably non-representative. The same applies to the storage coefficients calculated from TH5.

The transmissivity values calculated from TH3 and TH6, which ranged from 10,154 IGPD/Ft. to 12,774 IGPD/Ft. are more representative. The storage coefficient values calculated from TH3 of 1.38×10^{-4} and 5.60×10^{-4} are also felt to be the most reliable.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The 20 year safe yield calculated using a transmissivity value of 10,154 IGPD/Ft. and an available drawdown of 58 feet is 195 IGPM.



Using the recommended entrance velocity of 0.1 Ft/Sec. for the well screens the design capacity of the screens is 98 IGPM (5 feet of 0.020" screen at 9 IGPM/Ft. and 5 feet 0.025 slot screen at 10.8 IGPM/Ft. The maximum pump capacity for 5 9/16" casing is generally 70 to 80 IGPM. For larger yields it is necessary to use 6 inch diameter or larger casing.

A yield of 70 to 80 IGPM will be more than adequate for the requirements of the proposed laboratory.

The actual yield of the pump will depend upon the head over which it has to lift the water, friction losses and desired discharge pressure. Once these data have been determined a pump can readily be selected.

The pump used in the pump test was a Sta-Rite, 2 H.P. 7 Stage Model 40 P46 with an open discharge capacity of 75 IGPM with a head of 38 feet.

The results of the chemical analyses of the water samples are shown in Figure 6. As the previous information on the water chemistry of the area indicated, the iron content of the water is very high (4.7 ppm).

With this amount of iron, filtering will be necessary. It is recommended that you contact Northwest Water Conditioning Ltd. for further information.

WESTERN INDUSTRIAL LABORATORIES LIMITED

LABORATORY REPORT

8109 - 102 STREET
EDMONTON, ALBERTA
T6E 4A4

TELEPHONE
439-7969

WATER ANALYSIS REPORT

Attention: Bob Rippon

Company: E B A Engineering Consultants Ltd. Date: 26 Mar. 75

Sample: Vegreville water sample Report No.: 332-76

Sample 22 Mar. 75 Lab. No.: 75-393

Determination ppm Epm

pH	7.80		
Total dissolved solids	1120		
Ignition loss	372		
Sodium & Potassium (Calc. as Na)	233		10.15
Calcium Ca	106		5.29
Magnesium Mg	35		2.88
Carbonate CO ₃	N/L		—
Bicarbonate HCO ₃	652		10.69
Alkalinity Total as CaCO ₃	535		—
Sulphate SO ₄	345		7.18
Chloride Cl	16		0.45
Total Hardness as CaCO ₃	408		—
Iron Fe	4.72		—
Fluoride F	0.13		

Remarks: If water is intended for drinking purposes the nearest

Public Health Unit should be consulted.

WESTERN INDUSTRIAL LABORATORIES LIMITED

Frank Harrison
Frank Harrison/Ry

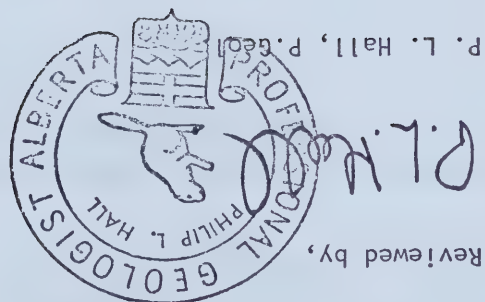
Respectfully submitted,

EBA ENGINEERING CONSULTANTS LTD.

R. E. Rippon

R. E. Rippon, Geologist

Reviewed by,



P. L. Hall, P. Geol.

RLR/sjm



REFERENCES

FARVOLDEN, R.N. (1963): Early Contributions to the Ground Water Hydrology of Alberta; Research Council of Alberta Bull. 12, 123 Pages.

LE BRETON, E.G. (1963): Ground Water Geology and Hydrology of east-Central Alberta; Research Council of Alberta Bull. 13, 64 Pages.

WALTON, W.C. (1961): Selected Analytical Methods for Well and Aquifer Evaluation, State of Illinois Bull. 49, 81 Pages.

APPENDIX A

ESTIMATED 20 YEAR SAFE YIELD

$$Q_{20} = \frac{T \times HA}{2110} \times 0.7$$

$$Q_{20} = \frac{10,154 \text{ IGPD/Ft.} \times 58 \text{ Ft.} \times 0.7}{2110} = 195 \text{ GPM}$$

Where: Q_{20} = Safe 20 year pumping rate in Imperial Gallons per Minute

T = Transmissivity in IGPD/Ft.

HA = Total Available Drawdown.



LITHOLOGY SYMBOLS

COAL



SHALE



CLAY



SILT



SAND - SANDSTONE



GRAVEL



PROJECT : TH NO. 1 (VEGREVILLE WATER SUPPLY) DATE DRILLED : MARCH 12, 1975
HOLE №: TH NO. 1 TOTAL DEPTH: LOCATION : TWP 52, RGE 15, SEC 23 LSD 3 W4TH ELEVATION : 2100 FEET

FROM	TO	LITHOLOGIC DESCRIPTION
0.0	3.0	SILTY CLAY, VERY FINE GRAINED, BUFF
3.0	9.0	SAND, MED. GRAINED, BUFF
9.0	23.7	SAND, COARSE GRAINED, DARK GREY
23.7	62.5	SILTY CLAY, VERY FINE GRAINED, LIGHT GREY
62.5	110.2	SILT AND CLAY, VERY FINE GRAINED, LIGHT GREY WITH TRACES OF VERY FINE SAND
110.2	129.0	(BEDROCK AT 110.2 FT. BELLY RIVER FORMATION)
129.0	129.2	SHALE, DARK GREY, COAL TRACES
129.2	138.0	SANDSTONE, FINE GRAINED, LIGHT GREY
138.0	140.4	SHALE, GREY
140.4	172.0	SHALY COAL
172.0	172.2	SHALE, GREY
172.2	187.8	GRAVEL LENSE
187.8	172.2	SHALE, GREY WITH COAL TRACES
187.8	190.0	SILTSTONE, VERY FINE GRAINED, BUFF
190.0	200.0	SANDSTONE, FINE GRAINED, LIGHT GREY
200.0	225.0	SHALE, GREY
225.0	226.0	SANDSTONE, FINE GRAINED, LIGHT GREY
226.0	235.0	SHALE, LIGHT GREY
235.0	236.4	SANDSTONE, FINE GRAINED, LIGHT GREY
236.4	261.0	SHALE, LIGHT GREY
261.0	262.6	SHALY COAL
262.6	264.0	SHALE, DARK GREY
264.0	266.0	SHALY COAL
266.0	270.2	SHALE, BLACK
270.2	282.0	SHALE, LIGHT GREY
282.0	284.0	SHALE, BLACK
284.0	289.0	SHALE, LIGHT GREY
289.0	290.7	COAL
290.7	303.9	SHALE, LIGHT GREY
303.9	315.8	SHALE, BLACK
315.8	362.0	SHALE, LIGHT GREY
362.0	363.0	COAL
363.0	385.0	SHALE, LIGHT GREY

PROJECT :
HOLE №: TH NO. 1
LOCATION :
DATE DRILLED :
TOTAL DEPTH :
ELEVATION :

FROM	TO	LITHOLOGIC DESCRIPTION
385.0	387.0	COAL
387.0	394.0	SHALE, LIGHT GREY
394.0	396.3	COAL
396.3	443.0	SHALE, LIGHT GREY
443.0	447.0	SANDSTONE, FINE GRAINED, LIGHT GREY, CALCAREOUS
447.0	450.0	SHALE, LIGHT GREY
450.0	456.0	SANDSTONE, FINE GRAINED, LIGHT GREY, CALCAREOUS (HARD)
456.0	500.0	SANDSTONE, FINE TO MEDIUM GRAINED, LIGHT GREY, POORLY CEMENTED
END OF HOLE (500 FEET)		



EBA Engineering Consultants Ltd.

DATE

APRIL 1/75

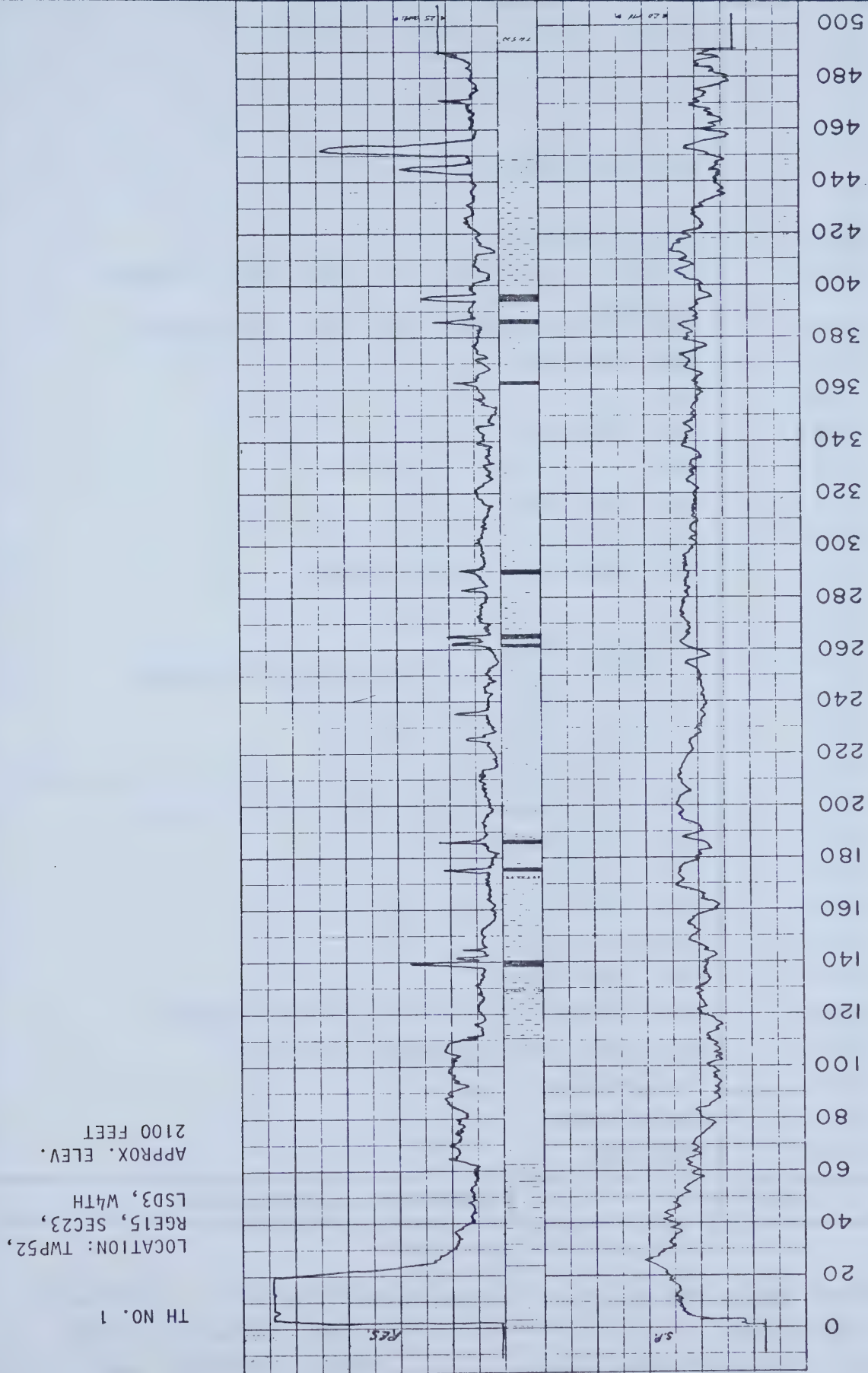
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JOB NO.

E - 1028

DWG NO.

28-1



TH NO. 1

LOCATION: TWP52,
RGE15, SEC23,
LSD3, W4TH

APPROX. ELEV.
2100 FEET

PROJECT : VEGREVILLE WATER SUPPLY
 HOLE No: TH NO. 2
 DATE DRILLED : MARCH 11, 1975
 TOTAL DEPTH : 500 FEET
 LOCATION : TWP 52, RGE 15, SEC 23, LSD 10, WITH ELEVATION : 2100 FEET

FROM	TO	LITHOLOGIC DESCRIPTION
0.0	17.0	CLAY, BUFF
17.0	20.4	GLACIAL GRAVEL
20.4	31.2	CLAY, DARK GREY
31.2	58.0	SILTY CLAY, VERY FINE GRAINED, LIGHT GREY
58.0	67.0	SAND, FINE GRAINED, LIGHT GREY (BEDROCK CHANNEL)
67.0	68.0	SAND, COARSE GRAINED
68.0	69.5	CLAY, DARK GREY
69.5	76.0	SAND, FINE GRAINED LIGHT GREY
76.0	78.0	CLAY, DARK GREY
78.0	96.0	VERY COARSE SAND AND GRAVEL
96.0	114.2	SAND, FINE TO VERY COARSE, WITH SOME GRAVEL (10%)
114.2	124.0	SHALE, LIGHT GREY (BEDROCK AT 114.2', BELLY RIVER FORMATION)
124.0	125.7	SANDSTONE, FINE GRAINED, GREENISH
125.7	234.0	SHALE, LIGHT GREY, WITH COAL TRACES
234.0	236.3	SANDSTONE, FINE GRAINED, LIGHT GREY, WELL CEMENTED
236.3	271.3	SHALE, LIGHT GREY
271.3	274.4	COAL
274.4	330.0	SHALE, DARK GREY, WITH COAL TRACES
330.0	334.2	SHALY COAL
334.2	379.0	SHALE, DARK GREY
379.0	380.3	COAL
380.3	388.0	SHALE, DARK GREY
388.0	390.2	COAL
390.2	454.0	SHALE, DARK GREY
454.0	462.0	SANDSTONE, FINE GRAINED, LIGHT GREY, WELL CEMENTED, CALCAREOUS
462.0	492.0	SANDSTONE, FINE GRAINED, LIGHT GREY, POORLY CEMENTED
492.0	500.0	SHALE, LIGHT GREY
END OF HOLE (500 FEET)		



EBA Engineering Consultants Ltd.

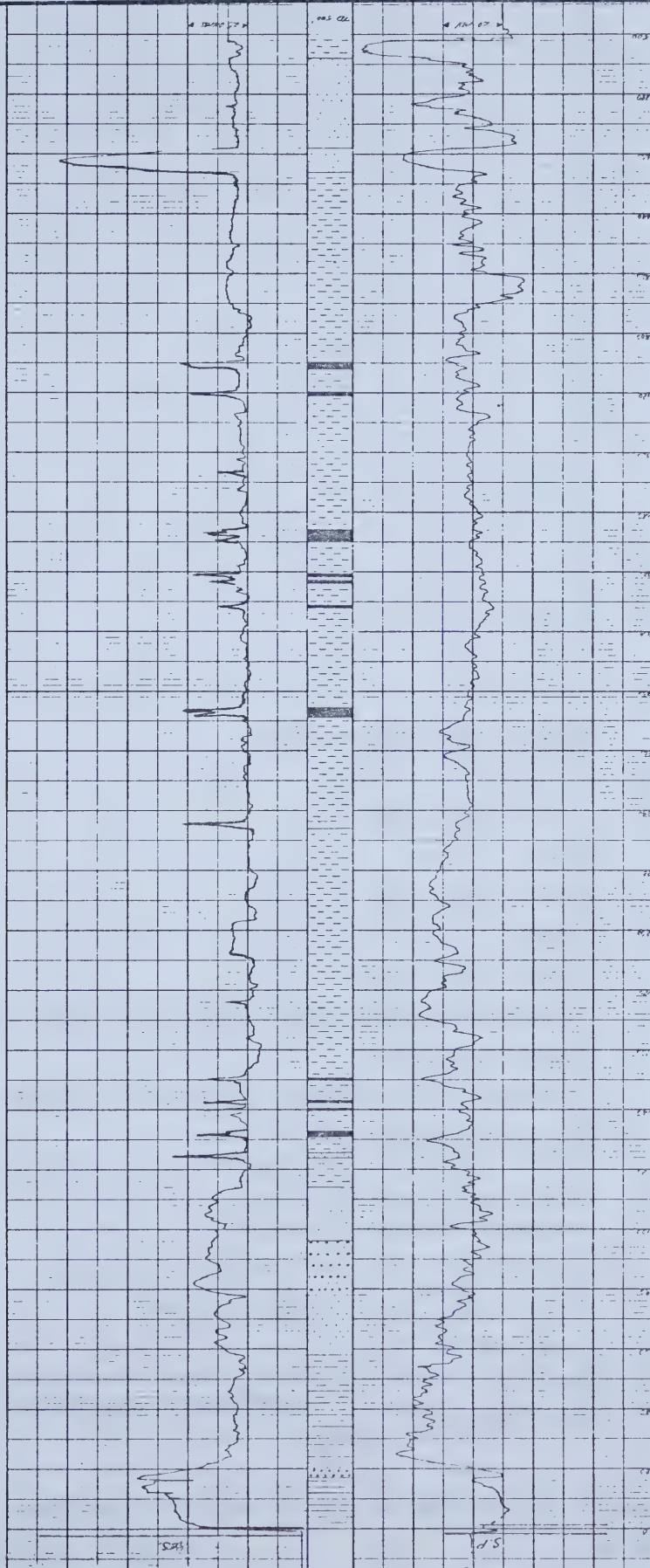
DATE

SCALE

JOB No.

E 1028

DWG No.



2100 FEET

APPROXIMATE ELEV.

WITH

LOCATION: TWP52,
RGE15, SEC23, LSD1

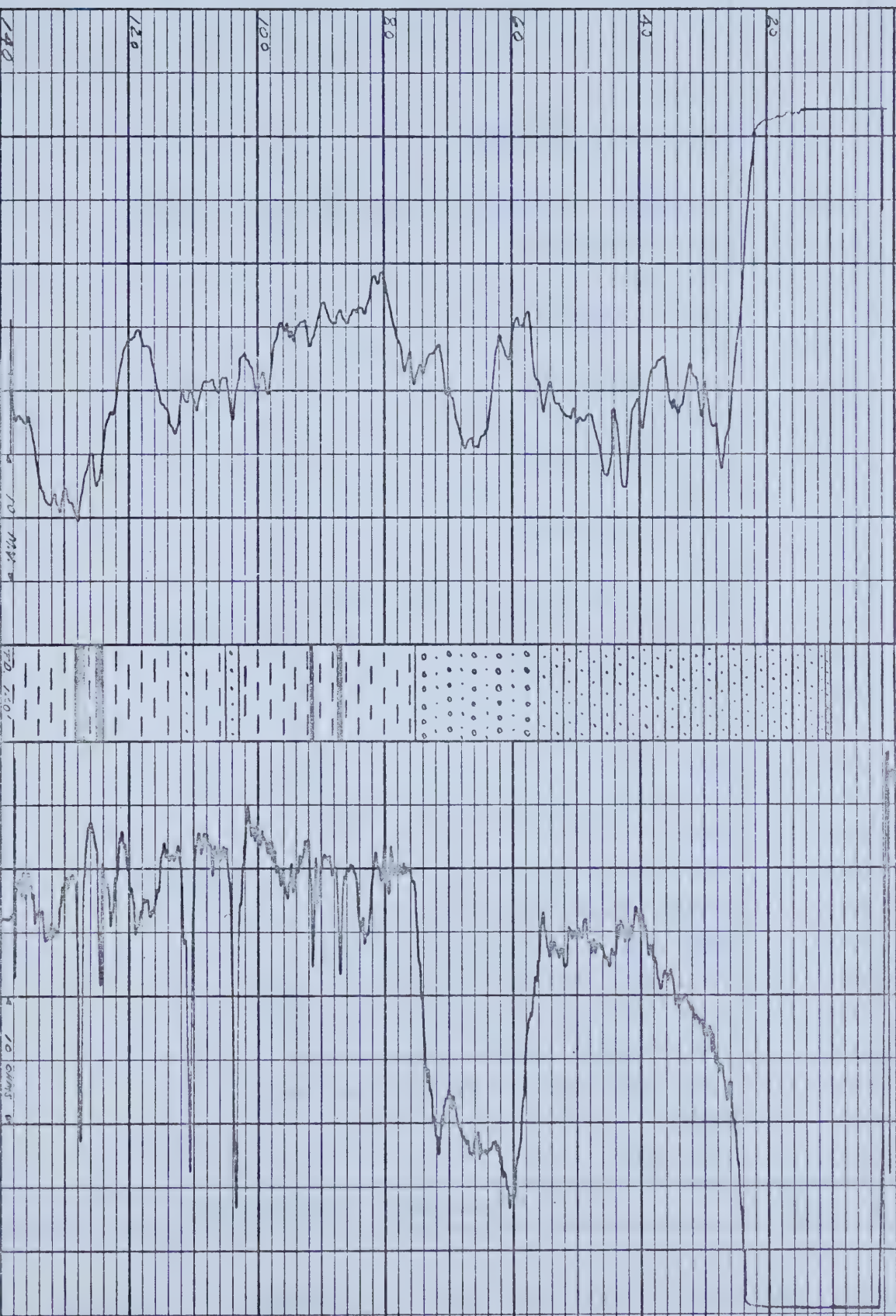
TH NO. 2

PROJECT : VEGREVILLE WATER SUPPLY
 HOLE №: TH NO. 3
 LOCATION : TWP 52, RGE 15, SEC 23 LSD 10, W4TH ELEVATION : 2100 FEET
 DATE DRILLED : MARCH 13, 1975
 TOTAL DEPTH : 140 FEET

FROM	TO	LITHOLOGIC DESCRIPTION
0.0	10.0	CLAY, BUFF
10.0	11.0	SANDY CLAY, BUFF, TRACES OF GRAVEL
11.0	56.0	SANDY CLAY, VERY FINE GRAINED, DARK GREY
56.0	73.0	(BEDROCK CHANNEL DEPOSITS) VERY COARSE SAND TO GRAVEL
73.0	103.0	SHALE, DARK GREY (BEDROCK AT 73.0', BELLY RIVER FORMATION) WITH COAL TRACES
103.0	105.0	SANDSTONE, FINE GRAINED, LIGHT GREY, POORLY CEMENTED
105.0	110.0	SHALE, DARK GREY
110.0	112.0	SANDSTONE, FINE GRAINED, LIGHT GREY, POORLY CEMENTED
112.0	124.0	SHALE, DARK GREY
124.0	125.0	COAL
125.0	127.0	SHALE, DARK GREY
127.0	128.0	COAL
128.0	140.0	SHALE, DARK GREY
END OF HOLE (140 FEET)		

TEST HOLE NO. 3 (OBSERVATION WELL)
LOCATION: TWP52, RGE15, SEC23, LSD9, W4TH
ELEVATION: 2100 FEET

RES.



DATE

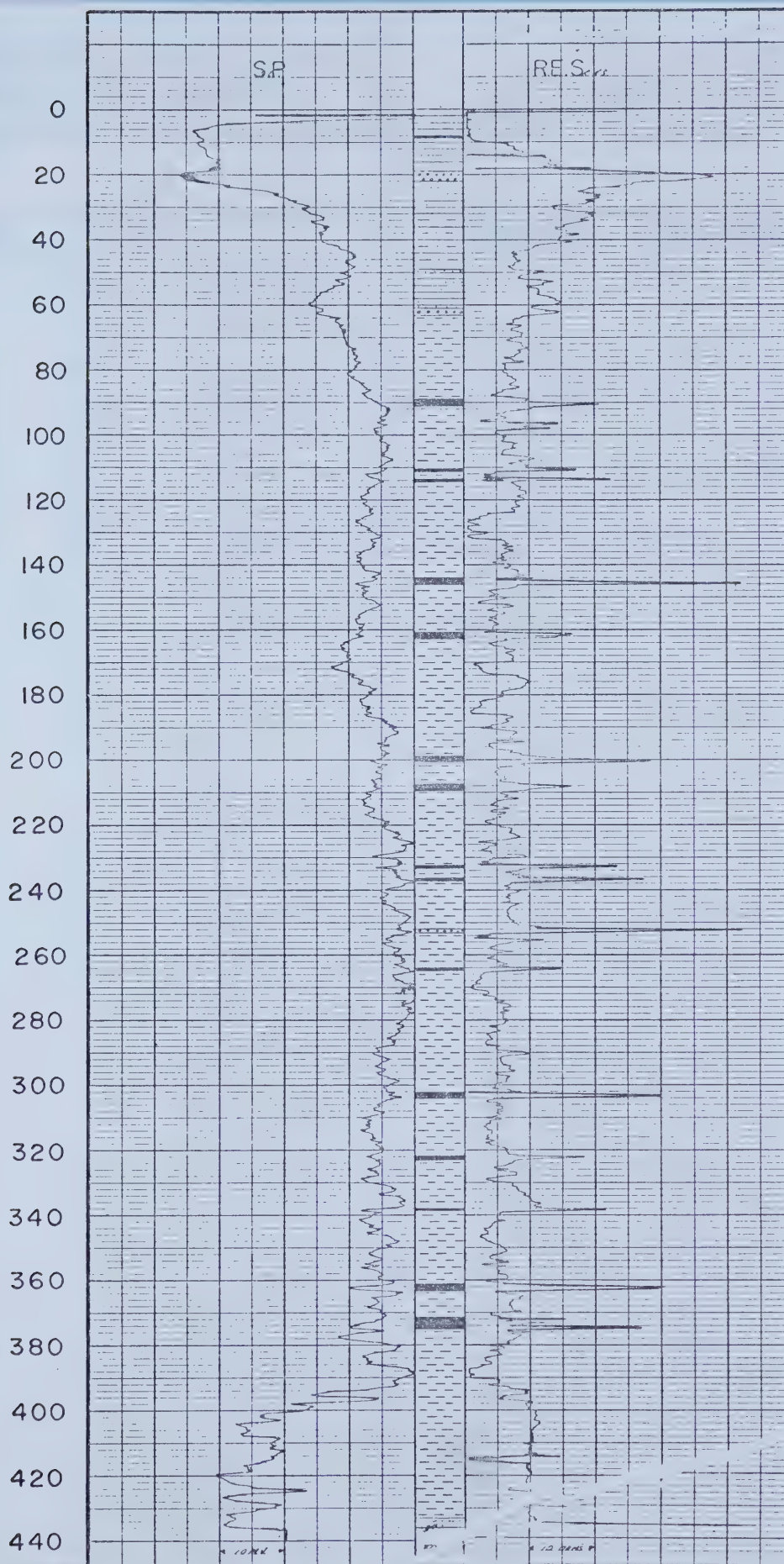
SCALE

JOB NO

DWG NO

PROJECT : VEGREVILLE WATER SUPPLY
HOLE №: TH 4
LOCATION : TWP52, RGE15, SEC23, LSD9, W4TH
DATE DRILLED : MARCH 13, 1975
TOTAL DEPTH: 436 FEET
ELEVATION : 2100 FEET

FROM	TO	LITHOLOGIC DESCRIPTION
0.0	8.0	CLAY, BUFF
8.0	8.5	GRAVEL
8.5	18.8	SANDY CLAY, VERY FINE GRAINED, DARK GREY
18.8	22.0	GLACIAL GRAVEL (PEGMATITE AND GRANITE)
22.0	31.8	SANDY CLAY, VERY FINE GRAINED, DARK GREY
31.8	49.0	SILTY CLAY, VERY FINE GRAINED, DARK GREY
49.0	61.0	SANDY CLAY, FINE GRAINED, LIGHT GREY
61.0	63.0	GRAVEL (BEDROCK CHANNEL DEPOSITS)
63.0	89.0	SHALE, LIGHT GREY (BEDROCK - BELLY RIVER FORMATION)
89.0	91.0	COAL
91.0	144.5	SHALE, LIGHT GREY, WITH COAL TRACES
144.5	146.0	COAL
146.0	161.0	SHALE, LIGHT GREY
161.0	163.0	COAL
163.0	252.0	SHALE, LIGHT GREY WITH COAL TRACES
252.0	253.0	SANDSTONE, FINE GRAINED, LIGHT GREY, WELL CEMENTED
253.0	302.4	SHALE, LIGHT GREY, WITH COAL TRACES
302.4	304.0	COAL
304.0	321.7	SHALE, LIGHT GREY
321.7	323.0	COAL
323.0	338.0	SHALE, LIGHT GREY
338.0	339.0	COAL
339.0	361.0	SHALE, LIGHT GREY
361.0	363.0	COAL
363.0	372.0	SHALE, LIGHT GREY
372.0	375.0	SHALY COAL
375.0	433.0	SHALE, LIGHT GREY
433.0	436.0	SANDSTONE, FINE GRAINED, LIGHT GREY, WELL CEMENTED
END OF HOLE (436 FEET)		



TH NO. 4

LOCATION: TWP52,
RGE.15, SEC23,
LSD9, W4TH

APPROXIMATE ELEV.
2100 FEET



EBA Engineering Consultants Ltd.

DATE

APRIL 1/75

SCALE

AS SHOWN

JOB No.

E - 1028

DWG No.

28-3

PROJECT: VEGREVILLE WATER SUPPLY

DATE DRILLED: MARCH 18, 1975

HOLE N^o: TH NO. 5

TOTAL DEPTH: 100 FEET

LOCATION: TWP52, RGE15, SEC23, LSD10, W4TH

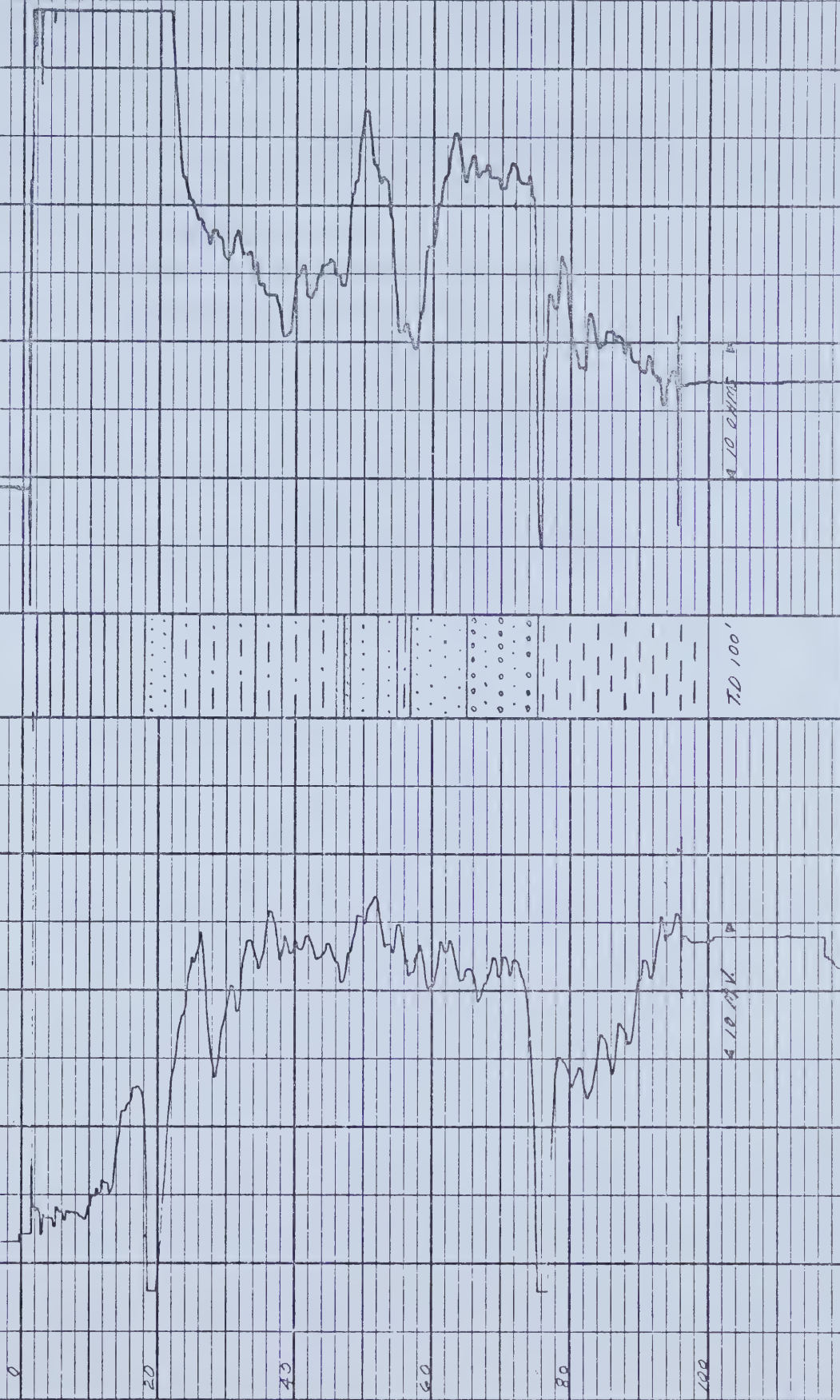
ELEVATION: 2100 FEET

FROM	TO	LITHOLOGIC DESCRIPTION
0.0	18.0	CLAY, BUFF
18.0	22.0	SAND, MEDIUM GRAINED, BUFF
22.0	47.3	SILTY CLAY, VERY FINE GRAINED, DARK GREY
47.3	55.0	SANDY CLAY, FINE GRAINED, DARK GREY
55.0	57.0	SILTY CLAY, VERY FINE GRAINED
57.0	65.0	SAND, FINE TO COARSE GRAINED, (BEDROCK CHANNEL)
65.0	75.5	VERY COARSE SAND AND GRAVEL (60%)
75.5	100.0	SHALE, DARK GREY (BEDROCK - BELLY RIVER FORMATION)
		END OF HOLE (100 FEET)

TEST HOLE NO. 5 (OBSERVATION WELL)
 LOCATION: TWP52, RGE15, SEC23, LSD10, W4TH
 APPROX. ELEVATION: 2100 FT.

SP

RES



10 20 30 40 50 60 70 80 90 100

10 100'

PROJECT: VEGREVILLE WATER SUPPLY

DATE DRILLED: MARCH 18, 1975

HOLE N^o: TH NO 6

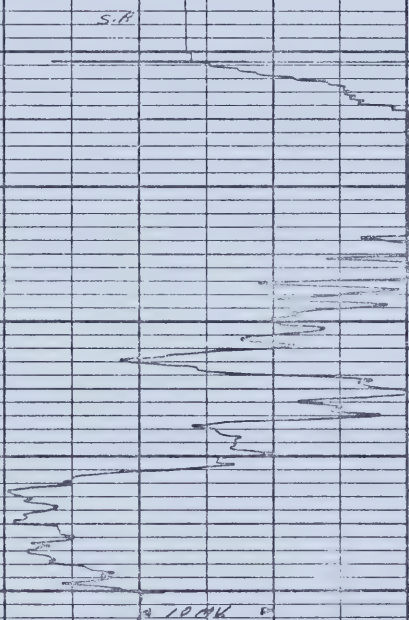
TOTAL DEPTH: 100 FEET

LOCATION: TWP52, RGE15, SEC23, LSD10, W4TH

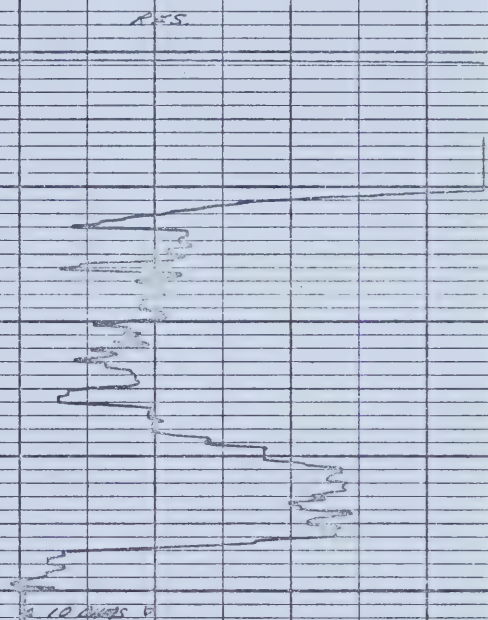
ELEVATION: 2100 FEET

FROM	TO	LITHOLOGIC DESCRIPTION
0.0	16.0	CLAY, BUFF
16.0	25.0	SAND, MEDIUM GREY, BUFF
25.0	57.0	SILTY CLAY, VERY FINE GRAINED, DARK GREY
57.0	75.5	SAND AND GRAVEL (BEDROCK CHANNEL) 57.0 - 60.0 SAND, FINE TO MEDIUM GRAINED FINE GRAINED - 45% MEDIUM GRAINED - 55% 60.0 - 65.0 SAND, FINE TO COARSE GRAINED FINE TO MEDIUM GRAINED - 20% COARSE GRAINED - 80% 65.0 - 70.0 SAND, COARSE GRAINED TO GRAVEL GRAVEL - 45% COARSE TO VERY COARSE - 55% 70.0 - 75.5 SAND, COARSE GRAINED TO GRAVEL COARSE TO VERY COARSE - 25% GRAVEL - 75%
75.5	100.0	SHALE, DARK GREY, (BEDROCK - BELLY RIVER FORMATION) END OF HOLE (100 FEET)

TEST HOLE NO. 6 (PUMPING WELL) MAR. 19/75
LOCATION: TWP52, RGE15, SEC23, LSD10 W4TH
APPROXIMATE ELEVATION: 2100 FEET



TO 100'



TO 100'



EBA Engineering Consultants Ltd.

DATE
APRIL 1/75

SCALE
AS SHOWN

JOB No
E 107

DWG No
28-6



PUMPING TEST SUMMARY

PROJECT: VEGREVILLE WATER SUPPLY

LOCATION: TWP 52, RGE 15, SEC 23, LSD 10, W4TH

DURATION OF TEST: from Mar 21/75, 16:00 Hr. to Mar 22/75, 16:00 Hr.

TESTS PERFORMED: Step Drawdown ☐ Constant Rate ☒
Constant Head ☐ Recovery ☒

PUMP DETAILS:

Type STA-RITE (2 H.P.)

Serial Number 40 P46 Diameter 4½ INCHES

Number of Stages 7

Rated Capacity _____ gpm at _____ head

Depth of intake 38.0 FEET

Power Unit 5 KVA 60 CYCLE POWER GENERATOR

Discharge Measurement 5 GAL. PAIL & STOP WATCH

Discharged to SMALL STREAM

Water Levels Measured with WELL SOUNDER

AQUIFER CHARACTERISTICS:

Formation VEGREVILLE BEDROCK CHANNEL

Elevation Top 57.0 Bottom 75.5 Thickness 18.5 FT.

Comment

Confined ☒ Leaky Conditions ☐ Unconfined ☐

Boundary Conditions UNKNOWN

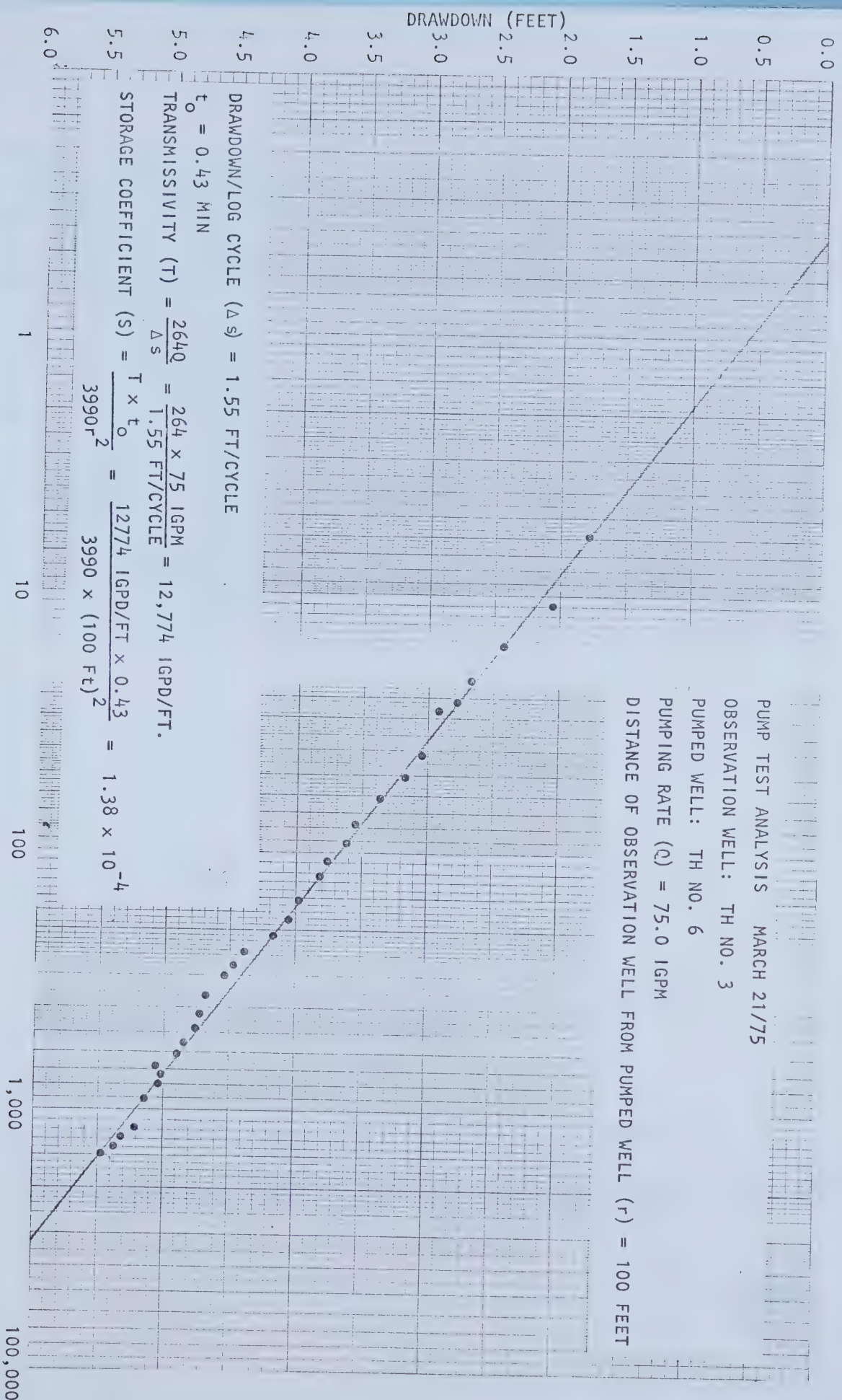
Weather during test LOW PRESSURE SYSTEM (-10°C, SNOW)

PUMP TEST RESULTS:

WELL	ELEV.	DEPTH	SCREEN	SWL.	DISTANCE r (feet)	Δs	TRANSMISSIVITY DRAWDOWN	STORAGE COEFF. - S	t _{9L}	t _{WT}
Pumped	-	72.8'	62.8'-72.8'	4.4' AGL	-	1.70	11,647	-		
Obs. 3	-	69.0'	64.0'-69.0'	5.3' AGL	100'	1.50	12,774	1.38 × 10 ⁻⁴		
Obs. 5	-	72.0'	67.0'-72.0'	0.0'	300'	0.94	21,064	6.78 × 10 ⁻⁴		
Obs.										
Obs.										
Obs.										

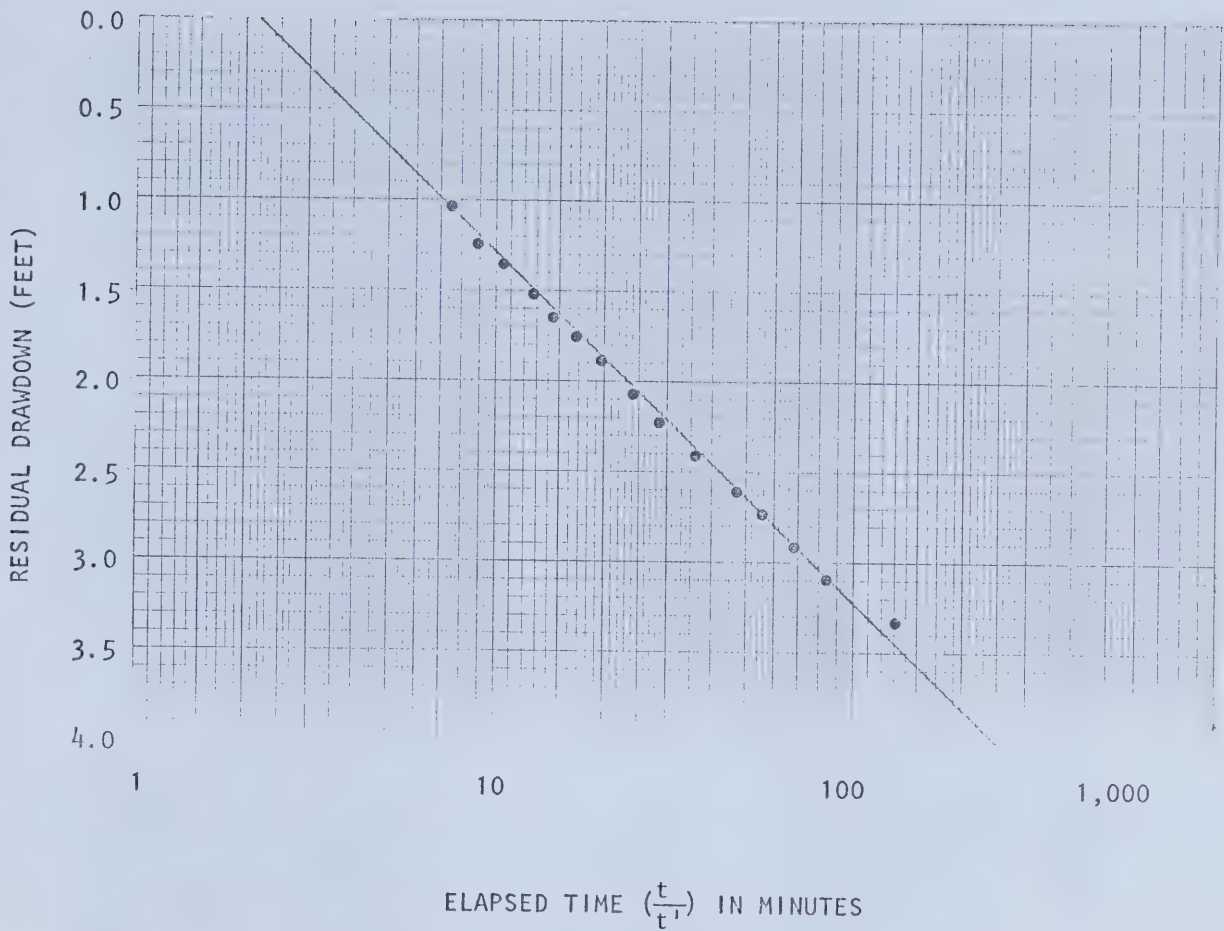
FIELD SUPERVISION P.E.R.

ANALYSIS P.E.R.



ELAPSED TIME (t) IN MINUTES





PUMP TEST ANALYSIS MARCH 21/75

OBSERVATION WELL: TH 3

PUMPED WELL: TH 6

PUMPING RATE = 75 IGPM

DISTANCE OF OBSERVATION WELL FROM PUMPED WELL (r) = 100 FEET

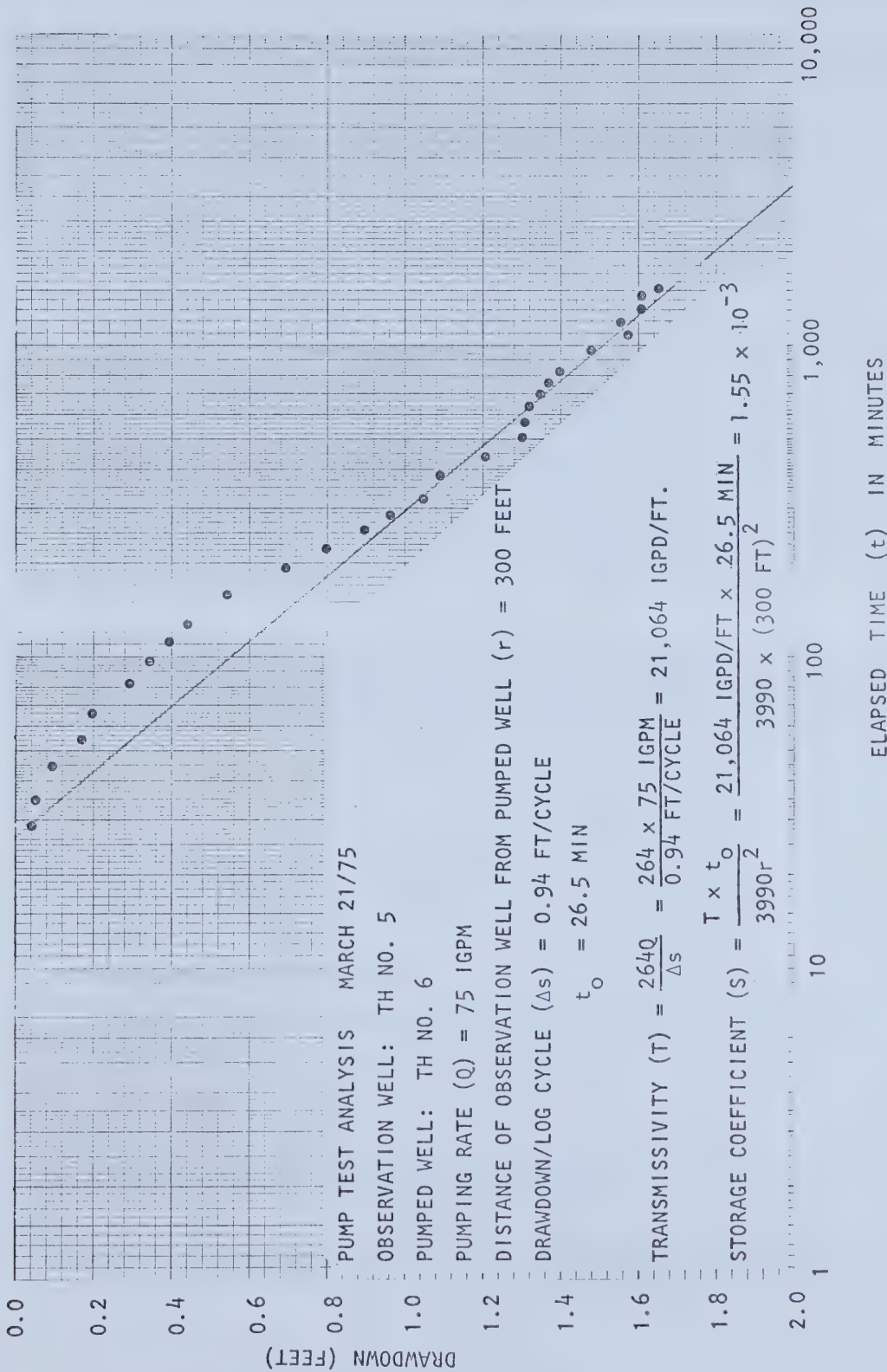
DRAWDOWN/LOG CYCLE (Δs) = 1.95 FT/CYCLE

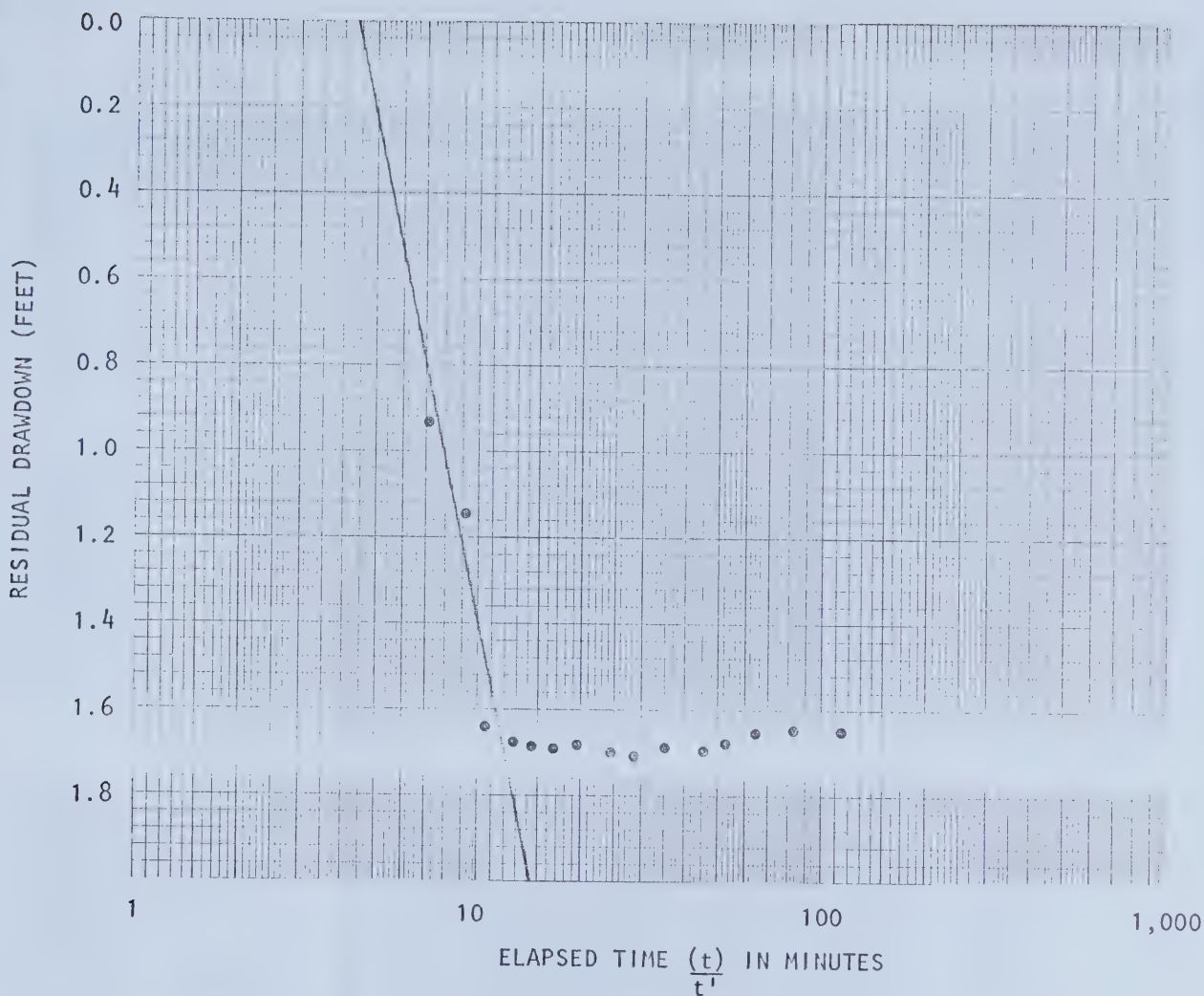
t_o = 2.2 MIN

$$\text{TRANSMISSIVITY (T)} = \frac{264Q}{\Delta s} = \frac{264 \times 75 \text{ IGPM}}{1.95 \text{ FT/CYCLE}} = 10,154 \text{ IGPD/FT.}$$

$$\text{STORAGE COEFFICIENT (S)} = \frac{T \times t_o}{3990r^2} = \frac{10,154 \text{ IGPD/FT} \times 2.2 \text{ MIN}}{3990 \times (100\text{ft})^2} = 5.60 \times 10^{-4}$$







PUMP TEST ANALYSIS MARCH 21/75

OBSERVATION WELL: TH NO. 5

PUMPED WELL: TH NO. 6

PUMPING RATE (Q) = 75 IGPM

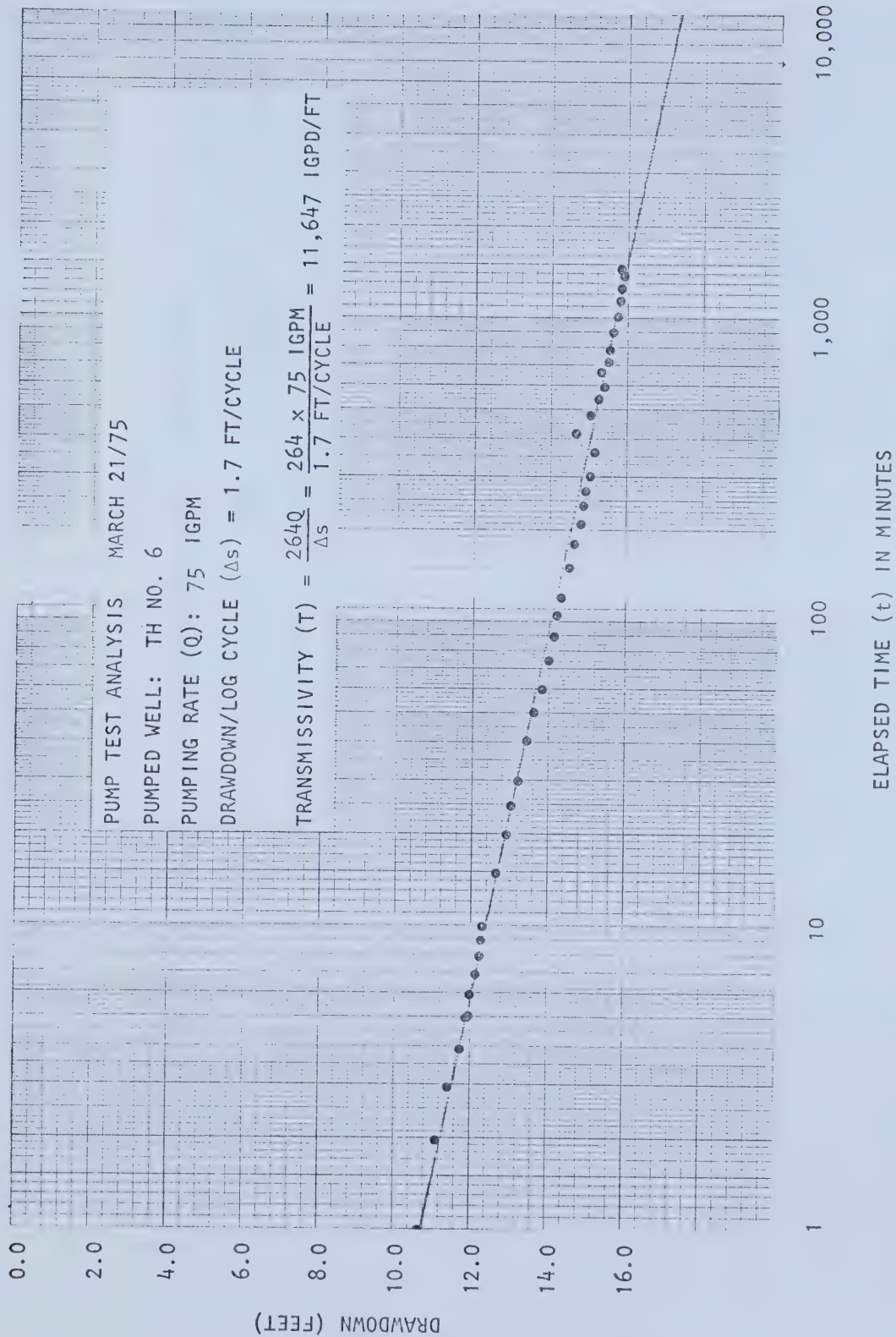
DISTANCE OF OBSERVATION WELL FROM PUMPED WELL (r) = 300 FEET

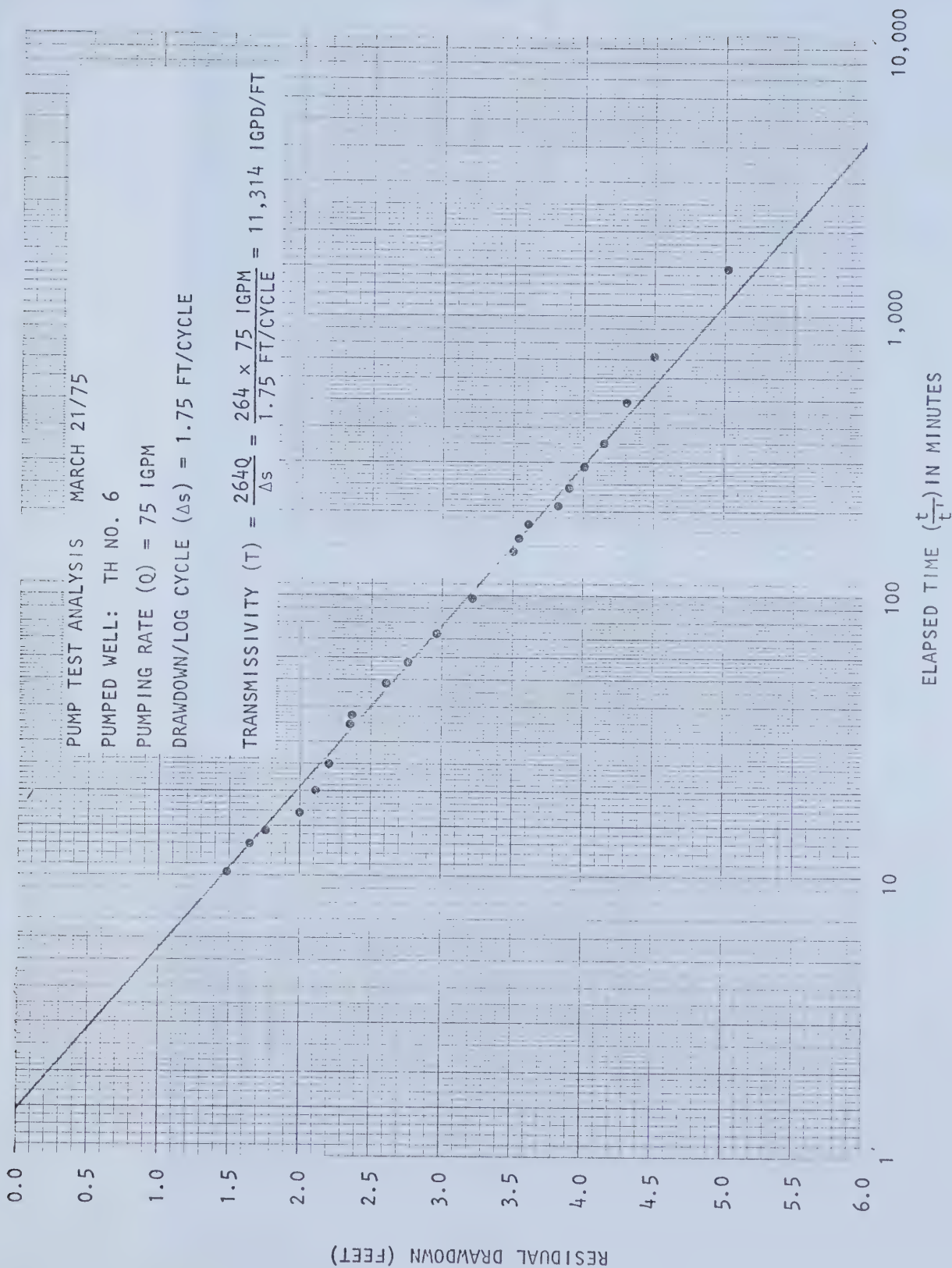
DRAWDOWN/LOG CYCLE (Δs) = 3.84 FT/CYCLE

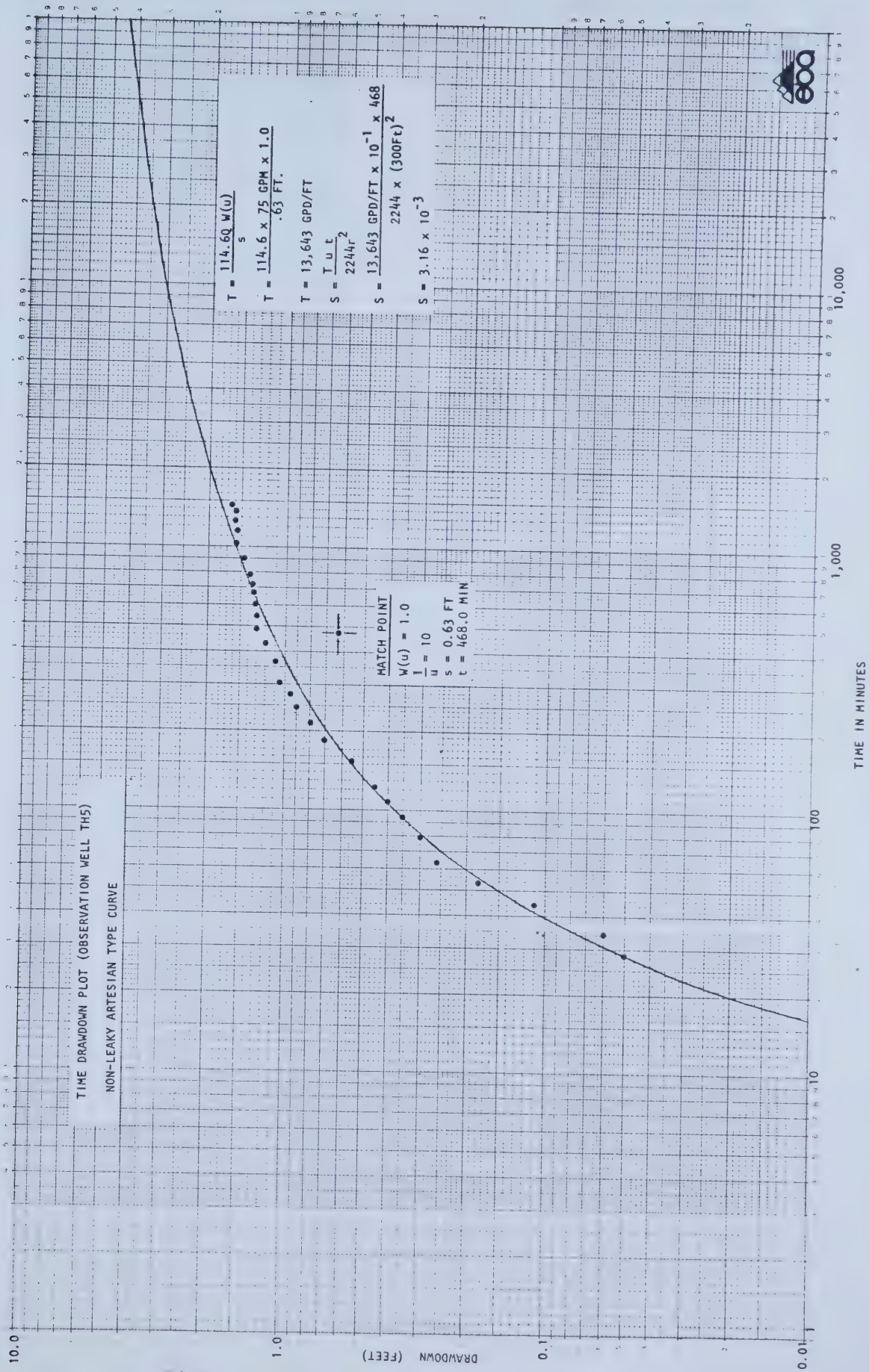
$t_o = 4.30$ -MIN

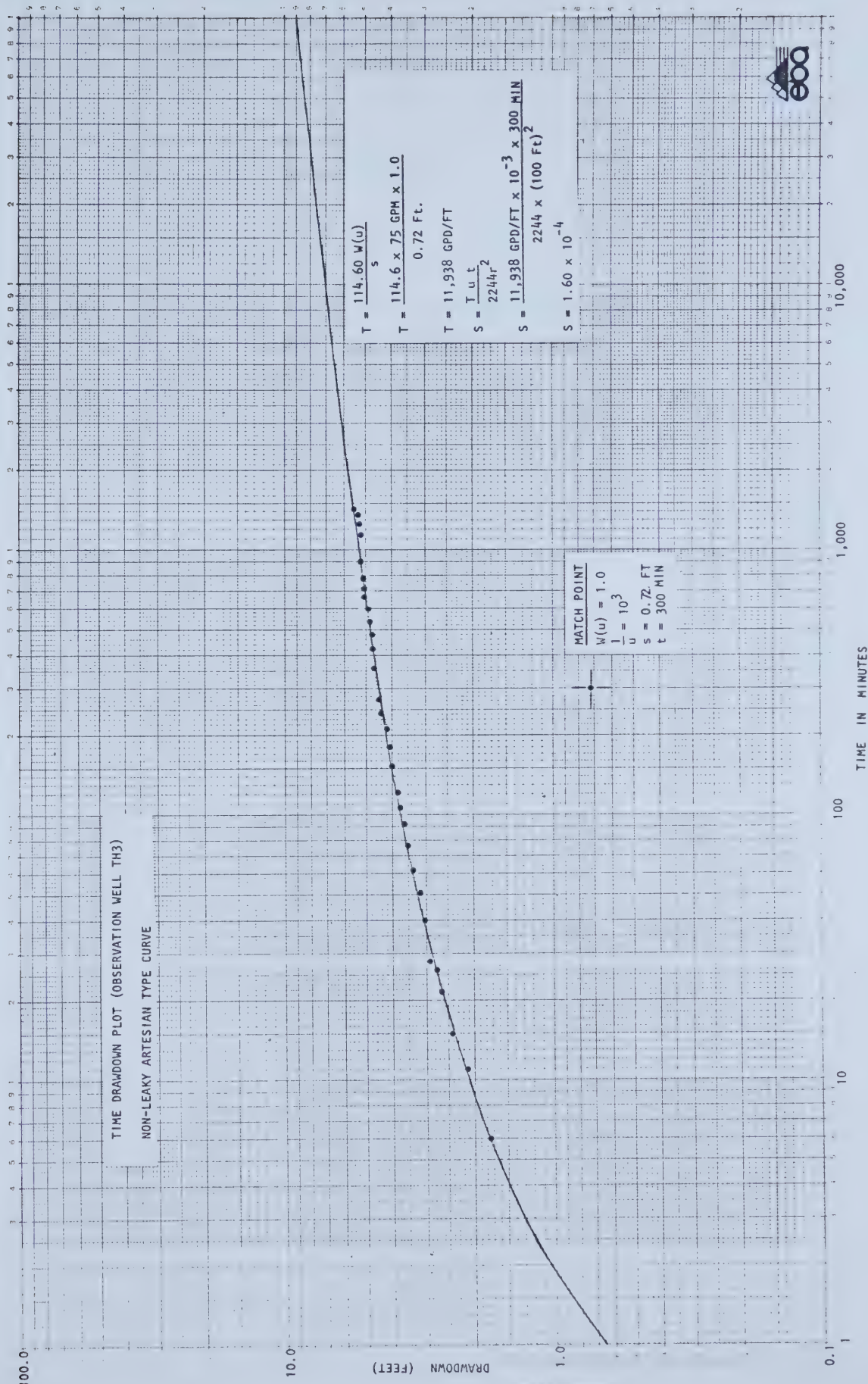
$$\text{TRANSMISSIVITY (T)} = \frac{264Q}{\Delta s} = \frac{264 \times 75 \text{ IGPM}}{3.84 \text{ FT/CYCLE}} = 5,156 \text{ IGPD/FT}$$

$$\text{STORAGE COEFFICIENT (S)} = \frac{T \times t_o}{3990r^2} = \frac{5,156 \text{ IGPD/FT} \times 4.305}{3990 \times (300\text{Ft})^2} = 6.17 \times 10^{-5}$$









APPENDIX B

WATER WELL RECORDS FROM THE ALBERTA DEPARTMENT
OF THE ENVIRONMENT AND LICENSING BRANCH
AND THE ALBERTA RESEARCH COUNCIL





EBA Engineering Consultants Ltd.

GROUND WATER GROUP

SUMMARY OF AVAILABLE WATER WELL RECORDS

MERIDIAN 4 TOWNSHIP 52 RANGE 14

FILE E 1028
DATE 12/02/75CLIENT DEPT. OF ENVIRONMENT
COMPILED BY R.E. RIPPO

PAGE 1/3

WELL DATA

WATER CHEMISTRY

LSD		SEC	TOTAL DEPTH	WTC WATER LEVEL DEPTH, ELEV	WATER-BEARING ZONES		T	S	PUMP TEST DUR	Q	Q20	DEPTH TO PUMP/SCREEN	COMMENTS	TDS	Ca	Mg	Na+K	CO3	HCO3	SO4	Cl	NO2	NO3	Fe	F	PH	HARDNESS AS CaCO3	COMMENTS
SW	18	18	80.0	15.0 2085	6-9 SD										946					0.0	140			2.5				
SW	18	18	54.0		9-19 SD CLAY								LITH LOG															
SW	18	18	109.0		65-72 SAND & GRAVEL																							
NE	18	18	158.0	23.0	104-109 WATER								LITH LOG															
					116-130 SD & COAL																							
					COAL																							
					136-148 SD & COAL																							
18		18	95.0	16.0	COAL								LITH LOG															
					35-41 SD & COAL				3.0				LITH LOG															
					49-51 SD & COAL																							
					61-64 COAL, SILT, SD																							
					80-82 SAND																							
SE	18	18	70.0	50.0 2050										1542					278	158			167	1.0			590	
SE	18	18	70.0	8.0 2092										970					80	98			1.48				25	
SE	18	18	80.0	8.0 2092										952						151	TRACE			1.1			5	
SE	18	18	90.0											1400	3	1			271	116			9	0.5	1.24		14	
SE	18	18	120.0	40.0										1170	4	2			142	116			6.3	2.2	1.26		18	
NW	18	18	65.0	7.0 2093										10854					6229	46			666				1000+	
NE	18	18	80.0	10.0 2090										954					42	148			2.0	0.7			19	
	18	18	96.0	60.0										978					16	132					.84			
	18	18	190.0											1042					150	68			26	0.87			62	
NW	19	19	95.0	10.0	20-24 GRAVEL				2.0				LITH LOG															
					52-54 L.S.																							
NW	19	19	200.0	30.0 2045	40-55 S.S.								LITH LOG															
					70-200 SH & SS																							
NW	19	19	46.0	1.0 2074	36-41 SS & GRAVEL								LITH LOG															
NW(2)	19	19	50.0	4.0 2071	24-44 SD								LITH LOG						484	68			0.42	3.4			81	
SW	19	19											RESERVOIR						117	184	4		0.45	0.1	0.21	8.1	143	
SW	19	19												312					137	10			0.52				81	
SW(5)	19	19	190.0	15.0										3358	376	158			1561	2			42	1.6		7.3	1600	



EBA Engineering Consultants Ltd.

GROUND WATER GROUP

SUMMARY OF AVAILABLE WATER WELL RECORDS

MERIDIAN 4 TOWNSHIP 52 RANGE 14

CLIENT DEPT. OF ENVIRONMENT
COMPILED BY R.E. RIPPONFILE E 1028
DATE 12/02/75

PAGE 2/3

WELL DATA

WATER CHEMISTRY

LSD		SEC	TOTAL DEPTH - FEET	WATER BEARING ZONES	T	S	PUMP TEST DURATION	Q	Q ₂₀	DEPTH TO PUMP SCREEN	COMMENTS	TDS	Ca	Mg	Na+K	CO ₃	HCO ₃	SO ₄	CL	NO ₂	NO ₃	Fe	F	PH	HARDNESS AS CaCO ₃	COMMENTS	
SE(2)	19	55.0	11.0									946							0.0	98		5	0.9			5	
SE(1)	19	140.0										1536						41.0	500		0.0	3.0	0.0			30	
SE(2)	19	102.0	15.0									800	6	6					90		1.0	0.1	0.94	8.5		40	
NW(12)	19	60.0	5.0 2070									1938						806	58	31	0.02	0.60				426	
NW(12)	19	40.0	20.0 2055									1172						395	8	0	3.0					150	
SW(3)	30	90.0	20.0									1187	39	27				363	9	0.9	0.1	0.24	8.0		214		
SW	30	140.0	10.0									1040	1.0	1.0				316	9	0.1	0.3	0.56			4		
SW	30	29.0										932	109	3	228.7		573	285	9	5.4	< .1	1.05	7.9		287		
SW(1)	30	45.0										1870						824	2	5.4					815		
NW	13	75.0		57-58 SD							LITH LOG																
				61-69 CLY & SD																							
NE	13	63.0		13-16 SD							LITH LOG																
				26-38 SD																							
				40-47 SD																							
NE	15	128.0		70-85 FINE SD							LITH LOG																
				85-91 SD & COAL																							
				91-100 SD																							
				100-109 SD & COAL																							
NW	23	20.0	20.0									1249	107	16				523	7	0.45	0.8	0.15				336	
NW	23	35.0	10.0									1417	120	43				475	8	0.90	0.2	0.22				480	
SE(2)	24	57.0	8.0									1182						391	8	0.00	1.0					90	
SE(7)	24	80.0	72.0									1020						101	88	0.00	0.93					33	
NW(4)	24	110.0	10.0 2075									1194						461	0.0	0.00	5.00					535	
NW(14)	24	80.0	FLOWING															138	7	7.00						100	
SE	24	132.0	12.0	39-49 SD																							
				98-101 LS																							
				104-113 SAND																							
SW	24	90.0	50.0									612	69	26				50	29	0.45	1.2	0.44				280	
SE(1)	25	90.0	6.0 2072									1066						310	3		2.0					375	
NE	25	40.0	20.0									996	194	60	65.3		552	391	7	0.45	0.5		7.6			728	
SE(1)	26	80.0	0.0									1170						437	6	0.00	3.8					545	
SE	26	23.0	12.0 2078									1214						456	14	0.00	4.1					540	

APPENDIX B

ORIGINAL PUMP TEST DATA

PUMPING TEST DATA

PAGE 1 OF 1

DRAWDOWN TEST

DATE _____

DAY	MO	YEAR
-----	----	------

CONSTANT DATE
STEP DRAWDOWN

PROJECT WINDFALL WATER SUPPLY

LOCATION TWP 52, R6E15, SEC 23, L5D10, W4TH

Pumped Well 7.5 ft 424' S, W624 Observation Well _____ r = _____ ft

Measuring Point 5' ASL Measured With rod sounder by SP

Elevation of Measuring Point _____ Static Water Level 4.40' msl

Pumping Rate (Q) 75.0 gpm

Depth of Screen 12.8 feet to 12.0 feet 10.0 aquifer thickness (m) 18.5 feet

confined ✓ unconfined _____ conditions

[illegible]

DRAWDOWN TEST

DATE _____

21	03	1975
DY	MO	YEAR

CONSTANT DATE
STEP DRAWDOWN

PROJECT VEGREVILLE WATER SUPPLY

LOCATION TWP 52, RBE 15, SEC 23, LSD 10, W4TH.

Pumped Well TEST HOLE G (WELL) Observation Well _____ r = _____ ft

Measuring Point 5' AGL Measured With WELL SOUNDER by ASR

Elevation of Measuring Point _____ Static Water Level 4.40 AGL

Pumping Rate (Q) 75.0 gpm

Depth of Screen 62.8 feet to 72.8 feet 10.0 aquifer thickness (m) 18.5 feet

confined ✓ unconfined _____ conditions

[illegible][illegible]

GROUNDWATER GROUP

RECOVERY DATA

DATE

2012 03 19 25
DY MT YEAR

PROJECT VEGRUNVILLE WATER SUPPLY

LOCATION FWP 5B, RGE 15, SEC 23, T5S 10, M4

PUMPED WELL TH.G. (WELL) OBSERVATION WELL to 0.0 ft.

MEASURING POINT 5.0 FT. BELOW ELEVATION STATIC WATER LEVEL 75.0 ft.

MEASURED WITH WELL WATER GAUGE BY R.L.P.

TIME		9:10	13:15	22:23	29:30	39:40	47:48	57:53	66:57	80
DY	H R	MIN	WATER LEVEL		TIME SINCE TEST STOPPED t' (MIN)	RATIO t/t'	RESIDUAL DRAW DOWN s' (ft)	DRAW DOWN FROM PUMPING CURVE s (ft)	CALCULATED RECOVERY (s-s') ft	COMMENTS
			FEET	FEET						
22	15	1.00	5.60	1441.0	1.0	1444.0	5.20			
			5.10	1442.0	2.0	721.0	1.50			
			4.90	1443.0	3.0	481.0	1.30			
			4.75	1444.0	4.0	361.0	1.15			
			4.60	1445.0	5.0	289.0	1.00			
			4.45	1446.0	6.0	241.0	1.70			
			4.40	1447.0	7.0	206.7	1.80			
			4.20	1448.0	8.0	181.0	1.60			
			4.15	1449.0	9.0	161.0	1.55			
			4.10	1450.0	10.0	145.0	1.50			
			3.80	1455.0	15.0	97.0	1.20			
			3.55	1460.0	20.0	73.0	1.15			
			3.35	1465.0	25.0	58.6	1.75			
			3.20	1470.0	30.0	49.0	1.60			
			2.95	1480.0	40.0	37.0	1.35			
			2.95	1490.0	50.0	29.8	1.35			
22	17	1.00	2.80	1500.0	10.0	25.0	1.20			
			2.71	1515.0	75.0	20.2	1.11			
			2.59	1530.0	90.0	17.0	1.77			
			2.36	1545.0	105.0	14.1	1.76			
22	19	1.20	2.23	1560.0	120.0	13.0	1.63			

PUMPING TEST DATA

PAGE 1 OF 2

DRAWDOWN TEST

DATE _____

21	03	1975
DY	MO	YEAR

PROJECT VICTORVILLE WATER SUPPLY

CONSTANT DATE ☒
STEP DRAWDOWN ☐

LOCATION TWP 52, RGE 15, SEC 23, LSD 9, W4TH

Pumped Well TH # 6 Observation Well TH # 3 $r =$ 100.0 ft

Measuring Point 6.0 FT. AGL Measured With WELL SONDER by REJ

Elevation of Measuring Point _____ Static Water Level 5.33 FT. A.G.L.

Pumping Rate (Q) 75.0 gpm

Depth of Screen 64.0 feet to 69.0 feet 5.0 aquifer thickness (m) 17.0 feet

confined ✓ unconfined _____ conditions

TIME			WATER LEVEL	ELAPSED TIME	DRAWDOWN
DY	HR	MIN	FEET	t (min)	s (feet)
21	16	00.	0.67	0.00	0.00
			2.45	6.00	1.78
			2.80	11.00	2.13
			3.10	16.00	2.43
			3.45	26.00	2.78
			3.60	28.00	2.93
			3.72	42.00	3.05
			3.85	51.50	3.18
21	17	02.	4.05	62.00	3.38
			4.20	77.00	3.53
			4.30	92.00	3.63
			4.45	107.00	3.78
21	18	02.	4.50	122.00	3.83
			4.65	152.00	3.91
21	19	02.	4.80	182.00	4.13
			4.85	212.00	4.18
21	20	03.	5.07	243.00	4.40
			5.14	272.00	4.47
21	21	02.	5.22	302.00	4.55
21	22	02.	5.36	362.00	4.69
21	23	04.	5.40	424.00	4.73
22	00	02.	5.43	482.00	4.76
22	01	02.	5.52	542.00	4.85
22	02	01.	5.58	601.00	4.91
22	03	04.	5.74	664.00	5.07
22	04	02.	5.70	722.00	5.03

[illegible]

PUMPING TEST DATA

PAGE 2 OF 2

DRAWDOWN TEST

DATE _____

21	03	1775
DY	MO	YEAR

PROJECT VEGRVILLE WATER SUPPLY

CONSTANT DATE
STEP DRAWDOWN

LOCATION TWP 52, RGE, 15, SEC 23, LSD 9, W4TH

Pumped Well TH # 6 Observation Well TH # 3 $r = 100$ ft

Measuring Point 6.0 FT A.G.L Measured With WELL SOUNDER by ADG

Elevation of Measuring Point _____ Static Water Level 5.33 FT, A.G.L.

Pumping Rate (Q) 75.0 gpm

Depth of Screen 64.0 feet to 69.0 feet 5.0 aquifer thickness (m) 17.0 feet

confined ✓ unconfined _____ conditions

[illegible][illegible]

TIME			WATER LEVEL	ELAPSED TIME	DRAWDOWN
DAY	HR	MIN	FEET	t (min)	s (feet)
21	16	00.	1.00	0.00	0.00
			1.00	18.00	0.00
			1.05	28.50	0.05
			1.06	34.00	0.06
			1.18	53.50	0.18
21	17	04.	1.21	64.00	0.21
			1.30	79.50	0.30
			1.35	94.00	0.35
			1.40	108.00	0.40
21	18	03.	1.45	123.30	0.45
			1.55	153.00	0.55
21	19	03.	1.70	183.00	0.70
			1.80	213.00	0.80
21	20	03.	1.90	246.00	0.90
			1.96	275.00	0.96
21	21	04.	2.05	304.50	1.05
21	22	04.	2.09	364.00	1.09
21	23	07.	2.20	427.00	1.20
22	00	05.	2.30	485.00	1.30
22	01	05.	2.30	545.00	1.30
22	02	04.	2.32	604.00	1.32
22	03	07.	2.34	667.00	1.34
22	04	05.	2.36	725.00	1.36
22	05	05.	2.39	785.00	1.39
22	07	03.	2.42	903.00	1.42
22	09	03.	2.57	1025.00	1.57

PUMPING TEST DATA

PAGE 2 OF 2

DRAWDOWN TEST

DATE _____

21	03	1975
DY	MO	YEAR

PROJECT VICTORIA WATER SUPPLY

CONSTANT DATE ☒
STEP DRAWDOWN ☐

LOCATION TWP 52, RGE 15, SEC 23, LSD 10, W4TH

Pumped Well TH 6 Observation Well TH 5 $r = 300.0$ ft

Measuring Point 1 FT A.G.L. Measured With WELL SONAR by ADP

Elevation of Measuring Point _____ Static Water Level 0.00 FT.

Pumping Rate (Q) 75.0 gpm

Depth of Screen 67.0 feet to 72.0 feet 5.0 aquifer thickness (m) 18.5 feet

confined / unconfined conditions

[illegible][illegible]

